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INCORPORATING

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CONTENTS

	PAGE
Editorial Notes	461
Letters to the Editor	466
Publications Received	466
The Scrap Heap	467
Overseas Railway Affairs	468
Peiping-Suiyuan Railway	470
Electric Spot Welding at Doncaster Works, L.N.E.R. . .	473
Engineering Works at Earls Court	474
Aluminium in Railway Coaches	484
Railway News Section	485

ELECTRIC RAILWAY TRACTION

A Supplement illustrating and describing developments in Electric Railway Traction is presented with each copy of this week's issue.

Earls Court Exhibition and Railways

SINCE the closing of the old Earls Court Exhibition the major portion of the site had remained unused, and many of the old exhibition buildings still stood. When the arrangements for the present exhibition building were being made, the London Passenger Transport Board agreed with the promoting company—Earls Court Limited—to make available a larger site than that previously occupied, and it is partly in connection with the preparation of this site that the complicated engineering works described on pages 474-483 became necessary. The firm of George Cohen Sons & Co. Ltd. was entrusted with the demolition of the major portion of the old Earls Court buildings, and the work, which had to be carried out within a very short contract period under heavy penalty, involved the removal of 10,000 tons of debris by road in just under six weeks. The completion of the job without a hitch of any kind recalls the fact that over 30 years ago the same firm was responsible for an unusual demolition task on this site after its purchase of the Big Wheel in 1906. It was then found that practically all the rivets were in an unsafe condition, and no fewer than 20,000 of them had to be cut out and replaced, in addition to the erection of large struts, before demolition proper could be begun.

Five Months' Passenger Traffics

The traffic figures of British standard gauge railways (excluding London Transport) for the first five months of 1937 which are published with the Ministry of Transport statistics for May show a remarkable expansion in passenger travel due very largely to the Coronation. During the month of May the numbers travelling were 90,640,580, an increase of 19,144,983, or 26.78 per cent., producing receipts of £4,944,411, which were higher by £1,028,289, or 26.26 per cent., than those for May, 1936. Of these receipts £691,470 (or 14 per cent.) were from standard fares, an increase of £146,876, or 26.97 per cent. For the whole five months passengers numbered 355,145,193, an increase of 22,990,054, or 6.92 per cent., bringing in receipts of £17,534,434, which showed an expansion of £1,373,024, or 8.50 per cent. Standard fare receipts amounting to £2,692,099 were 15.35 per cent. of the total ordinary passenger receipts, and showed an increase of £248,864, or 10.19 per cent. First class ordinary receipts for the five months were 8.93 per cent. of the total, and amounted to £1,565,919, an improvement of £156,730, or 11.12 per cent. Further improvement in Continental traffic is shown by the Southern Railway second class receipts of £193,781 for the five months, which were higher by £62,201, or 47.27 per cent. Season tickets of all main line companies for the five months brought in £3,655,685, an increase of £110,073, or 3.10 per cent. Parcels receipts, at £5,181,826, were higher by £12,599, or 0.24 per cent.

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The Week's Traffics

Last week's traffic increase for the four main line railways amounted to £103,000, comparing with an increase of £162,000 for the previous week. To date the combined receipts amount to £113,880,000, an increase of £4,761,000 or 4.36 per cent. Passenger train traffics for the 36 weeks total £52,176,000, an increase of £2,205,000 or 4.41 per cent. In the combined merchandise earnings of £38,804,500 there is a net gain of £1,155,000 or 3.07 per cent., and the coal class receipts of £22,899,500 show a net improvement of £1,401,000 or 6.52 per cent. The highest percentage increases in the different classes of traffic are the 5.43 of the Southern on the passenger side, the 4.22 of the Great Western in merchandise, and the 11.70 of the Great Western in coal.

	36th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	%
L.M.S.R. ..	+ 18,000	+ 2,000	+ 2,000	+ 22,000	+ 1,745,000	+ 3.96
L.N.E.R. ..	+ 6,000	+ 13,000	+ 25,000	+ 44,000	+ 1,542,000	+ 4.84
G.W.R. ..	- 4,000	+ 11,000	+ 15,000	+ 22,000	+ 940,000	+ 5.14
S.R. ..	+ 15,000	+ 500	- 500	+ 15,000	+ 534,000	+ 3.59

Mersey Railway traffics for the 36 weeks amount to £149,981, an increase of £5,088.

* * * *

Fruit Transport on the L.M.S.R.

As our columns have from time to time recorded, the L.M.S.R. has been active in research directed to improving methods for the transport of perishable goods. The favourable situation of the company for serving most of the fruit-growing areas in Scotland has made such activities something of a responsibility, owing to the large proportion of the fruit that is taken on the long journey to London and the South in L.M.S.R. trains. As shown by a recent article in *On Time*, the L.M.S.R. Operating Department journal, the company's contributions to minimising the time between the picking of the fruit and its display for sale embrace various matters of detail. Last year, for example, better service was offered to farmers and public by the provision of over 20,000 specially constructed

wooden trays to improve handling of the important raspberry traffic. These trays are loaded direct in the fields and are stacked four or five deep in the vans, whereas previously only one layer of fruit baskets was accommodated on the van floor. Normally, six special trains (including one for London direct) are required daily in the season to take the traffic to England from the fruit-growing districts of Central Perthshire and Angus, and the Clydeside district of Lanarkshire.

* * * *

G.W.R. Rolling Stock for 1938

Travellers by Great Western Railway in the coming year will enjoy what may be described as a dividend on the increasing traffic of the company during the past twelve months, for it is this growing patronage which has permitted the million-pound programme of new rolling stock outlined on page 493. The dividend will be paid in terms of comfort accruing from the 231 additional standard main-line coaches with end doors, large compartment windows, and comfortable seating; from five of a new type of buffet cars having snack bars as well as seating for 20 passengers at tables; and—remembering the importance of the excursionist—from a new ten-coach train in which 400 passengers may be served simultaneously with meals without leaving their seats. Less obvious, perhaps, but equally important to the general public and to traders, will be the availability of 900 more fitted wagons for running in express goods trains.

* * * *

The Intensive Use of Locomotives

That the policy of long continuous locomotive runs is justified when properly applied is being demonstrated daily in practice and confirmed also by published statistics of mileages run between heavy overhauls by modern locomotives, and by the fact that with greatly reduced numbers of locomotives, train mileages hauled are steadily increasing. This policy also provides evidence of the capacity of the modern locomotive efficiently managed and maintained to set up remarkable performances even when in almost continuous operation. We have in mind frequent journeys, particularly on the L.M.S.R. and L.N.E.R., both of which lines have for some time past adopted the intensive user policy. It is quite usual to find on the latter line a Pacific locomotive hauling a heavy load actually regaining lost time towards the end of a 400- or 500-mile run broken only by a brief change round from one train to another at, say, Newcastle. On the L.M.S.R. we noted a particularly fine performance the other day when No. 6212, *Duchess of Kent*, one of Mr. Stanier's Pacifics hauling a train of some 535 tons gross, gained over 8 minutes on schedule between Crewe and Euston, having covered the 158·1 miles in 152 min. 40 sec. at the end of a 400-mile run.

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Commendation for Railway Handling

In view of the fact that railways are so often decried as notorious for roughly-handling, damaging, and delaying consignments of goods or parcels committed to their charge, it is a welcome change to read in a recent issue of the *Worthing Gazette* a paragraph commending the Southern Railway for its handling of market-garden produce. It appears that two directors of Worthing and District Growers Limited, recently went to London to study at first hand the methods employed at London Bridge station and Covent Garden market. Their investigations were made without the knowledge of the railway staff. The visit to London Bridge was on a Monday night, when this traffic was heavy, and the directors in their report—published by the Worthing and West

Sussex Growers' Branch of the National Farmers' Union—express astonishment at the meticulous care with which the produce was handled. There was no throwing from hand to hand, and each package was carefully picked up in the van, carried, and placed in the appropriate lorry; at the market the same care was taken with the unloading of the lorries. They found congestion of lorries from all directions very great at Covent Garden, but it was evident that the late deliveries, sometimes complained of, were not due to any laxity on the part of the railway company, but to the fact that lorries had to wait for long periods before being able to get to the unloading points.

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Red Arrow Swiss Excursions

In Switzerland the use of the Red Arrow high-speed railcars has made possible excursion trips covering in one day an area of that country which in years gone by would have been regarded as material for a week's tour, and one costing a considerable sum in fares. For example, during August the Swiss Federal Railways advertised a Red Arrow trip from Lucerne, travelling first via Konolfingen to Thun, and then over the spectacular Lötschberg line via Spiez to Brigue, with a halt at Mittholz to permit the travellers to see the Blausee, and at Kandersteg for lunch. At Brigue the car was reversed, and ran down the Rhone Valley to Montreux, where several hours were allowed. Resuming along the Lake of Geneva the car then proceeded to Lausanne and Neuchâtel, and finally returned to Lucerne by way of Berne and Langnau. Starting shortly after 8 in the morning and returning in time for dinner, the participants thus, at the modest cost of 20 Swiss francs (roughly 18s. 6d.) covered 372 miles of Swiss territory, saw a considerable amount of two of its largest lakes and were carried over one of its finest scenic railway routes, and had three breaks for sightseeing at popular resorts. Among more direct trips one of the most popular is from Lucerne over the Gothard to Lugano and back, 248 miles in all, which is made every Thursday in summer. A maximum speed of 75 m.p.h. is attained on favourable stretches of line.

* * * *

The Peiping (Pekin) Suiyuan Railway

Apart from Shanghai, no place in China has figured so consistently in reports of the Sino-Japanese fighting as the Nankow Pass, the key to Peiping and the plains of China from Jehol, Mongolia, and the Provinces of Suiyuan and Shansi, and all-important strategically in that the Peiping-Suiyuan Railway traverses it. For this reason and because of its interest from the railway point of view, we publish a brief description of this line, and of the Nankow Pass section in particular, on page 470. In addition to references in the news to fierce fighting for the pass and for the towns of Nankow and Kalgan on the railway, messages were quoted in the news columns of our issue of September 10, reporting that the advancing Japanese forces were having to clear the summit tunnel under the pass of eight locomotives blown up in it by the retreating Chinese. The tunnel and all the types of locomotive on the line are described in our article. The centre of conflict now appears to be near Kalgan, an important town where the secondary workshops of the railway are situated. It was, no doubt, his recognition of the military importance of this railway that induced Generalissimo Chiang Kai-shek to allot large sums for raising the standard of the line, which had previously been extremely low; details of the measures taken appear in the article, as do those of the methods of working the very steep grades in the pass with articulated locomotives.

Defective Track Fastenings

A summary of Major G. R. S. Wilson's report on the derailment at Langrick, L.N.E.R., on March 8 appears on page 488. A train drawn by a K3 class engine at about 60 m.p.h. spread the road on a 40-ch. curve, where the track fastenings, which had for some time been deteriorating steadily, had at last become unfit for such a service. There was no speed limit and no criticism applies to the driver in that respect. We confess that these discoveries of appreciable defects in the track, made on other occasions in recent years, make a disagreeable impression for they show how near we have been to far more serious consequences. In this case, fortunately, the locomotive itself kept the rails, the tender initiating the derailment, or the results would probably have been much graver. The general improvement of late in speeds is a welcome one, which we have consistently advocated if the railways are to keep their place in the transport world. On cross-country journeys, where many stops are necessary, high speed is required to compensate for them and reduce the tedium of the journeys. Here the powerful general-purpose class of engine is most useful, but if the track is not kept up to the corresponding standard, safety is impaired, and the possible consequences of a derailment made more serious. We hope that Major Wilson's recommendations will be given full effect, leading to rapid improvement in the permanent way of so-called secondary lines so that high speed with safety may be the rule everywhere.

* * * *

Calling Assistance in Emergencies

In his report, summarised in our issue of July 9, on the accident at Barford, L.N.E.R., in the early hours of March 18, Lieut.-Col. A. H. L. Mount commented on the length of time that elapsed before a doctor or the stationmaster could be called, the train meanwhile standing at the home signal with the driver seriously injured. The signalman had to ring up a callman, and then send him to call a foreman to come and unlock the stationmaster's office and telephone for that official and a doctor. Col. Mount recommended that unless a Post Office telephone can be connected to a signal box at night the signalman should be instructed to advise the district control office, where there is one, when medical assistance is wanted, it then being the duty of the controller to use the Post Office telephone system to summon it. The arrangements in force on the German State Railway are interesting in this connection. On all main lines there are telephone boxes 1 km. ($\frac{5}{8}$ mile) apart, and arrows on the telegraph poles indicate which way to run to reach the nearest. From these it is possible at any hour to communicate with the *Fahrdienstleiter*—the leading traffic-controlling employee—at the nearest accident reporting station, certain stations, at regular intervals being so designated. This person is able to get into immediate touch with doctors, hospitals, fire brigades, breakdown and engineer's staff, having access to railway and public means of communication for that purpose. Test messages, at unexpected times, are given to prove the efficiency of those concerned.

* * * *

Sleeper Impregnation in India

Whenever possible Indian railways use sal or some other naturally durable wood for sleepers, but, as their supply is limited, very large quantities of inferior timbers such as *chir* pine and fir are also cut for this purpose. These, however, have to be preserved against decay, white ants, and splitting, the standard method of im-

pregnation being with hot coal tar creosote, or a mixture of that fluid and fuel oil, forced into the sleepers under pressure. This treatment has been used with conspicuous success, especially on the North Western Railway. In 1933-34, however, a committee appointed by the Railway Board recommended an extensive trial of the copper-arsenic water solution preservative, developed at the Dehra Dun Forest Research Institute, and some 10,000 sleepers have been treated with it, and with an auxiliary oil process to reduce splitting; these, too, have been laid in the N.W.R. track for observation. The normal life of pressure creosoted sleepers on that system is proving to be from 14 to 18 years for fir and from 20 to 22, or even more, years for *chir*, but the most recent experience in India, and over a longer period in America, leads one to expect only 8 to 11 years for these woods if treated with toxic water solutions or perhaps a little longer if combined with auxiliary anti-splitting treatment. Consequently further use of the copper-arsenic preservative is not considered justified at present, though it has a wide field other than for sleepers.

* * * *

Feeding Axleboxes with Emery

In a speech which he made on the occasion of the annual dinner of the Indian and Eastern Centre of the Institution of Locomotive Engineers, at Delhi, Mr. W. A. Stanier, who had been asked to give a summary of the impressions he had formed during his visits to Indian railways and workshops, referred to the design of the axleboxes used in that country. Whilst agreeing that the dust in India was abnormal, he pointed out that dust itself was not a cause of hot boxes. The late Mr. Churchward, when he was experimenting with the design of his carriage axleboxes, was very concerned about the number of occasions on which inspectors reported that the axleboxes were giving trouble because of dirt. He carried out an experiment by drilling a hole in the crown of an axlebox, fitting it with a pipe running up into a brake van, and feeding emery through this pipe to the journal during a run. At the end of the trip, it was found that the axlebox was not hot, although of course the journal itself was lapped away. This demonstrated that provided an axlebox was correctly designed to carry away the heat generated in running, and was well lubricated, grit and dirt would not in themselves produce a hot box.

* * * *

A Conquest Still Unmade

There is an important section of the populace to which a train, however coloured and entitled, is still just a train, and as such an object to be regarded with the suspicion accorded to all means of public transport which run to a timetable. We have seen an unreflecting fellow passenger rudely rebuffed in trying to assail this barrier of critical reserve. Catching sight of a streak of blue passing the carriage windows, he glanced wildly around the compartment for a sympathetic ear to receive the emotional exaltation which the episode had caused him. All the occupants save one being clearly aware of the stirring event just come to pass, he cried hoarsely to a total stranger in the opposite corner, "It's the Coronation, lady!" The object of this sudden confidence, recalled from the intellectual fastness in which she had doubtless been calmly pondering the menu for the morrow, responded with a frosty affirmative, and gripped the handle of her shopping basket more firmly as a warning against further irrelevancies of the same sort. To her the Coronation clearly ranked second in romance to a kippered herring. When the railways earn universal and spontaneous applause from the hand that rocks the cradle, they will have scored a triumph indeed.

Railways (Staff) Census

THE total amount of salaries and wages paid for the year 1936 by the railway companies of Great Britain and by the London Passenger Transport Board to their railway employees was £104,012,591, compared with £101,295,242 in 1935. This is one of the interesting facts contained in the Annual Return of Railway Staff (dated September 2, 1937) which was issued last week by the Ministry of Transport (H.M.S.O., price 1s.). A summary of the census is published on page 487 this week. It was generally known, of course, that the labour cost of the companies last year was heavy, but the actual figure is none the less surprising, while it is safe to say that the figures for 1937 and for 1938 will be higher still. True, railway revenues are rising, but, as the Ministry's figures show, labour's share of the net product of the railway industry is, indeed, very substantial and one which is growing year by year.

The total number of staff employed during the week ended March 13, 1937—the period covered by the return—was almost 600,000—a veritable army. The actual number was 599,652, compared with 585,611 during the week ended March 7, 1936, an increase of 14,041, or 2.4 per cent. The total of the conciliation grades was 334,963 and of the shop and artisan staff, 117,876.

The employees of the four main-line companies number 574,521, of which the London Midland & Scottish Railway accounts for 230,323, an increase over 1936 of 7,454. It is explained, however, that since last year some members of the staff of the Cheshire Lines Committee have been transferred to the London Midland & Scottish Company, in whose returns they are now included. Also, the London & North Eastern returns now include certain staff transferred from the Midland & Great Northern Joint Committee. Details are given of the numbers employed in the various grades by the principal undertakings. Engine drivers and motormen number 36,202, compared with 34,629 in 1936, and there is an increase of 881 goods guards, an indication of the heavier freight traffic handled. The average earnings of clerical, supervisory, &c., staff (excluding those entered under ancillary businesses) were 93s., an increase of 1s. over 1936; for conciliation staff, 66s. 1d., compared with 64s. 5d.; and for shop and artisan staff, 70s. 10d., or 1s. 11d. higher. These increases are partly due to the fact that in March, 1936, earnings were generally subject to a deduction of 2½ per cent., compared with a deduction 1¼ per cent. in March, 1937.

The return gives, for selected grades of staff, the rates of pay current at March 13, 1937, and March 7, 1936; also particulars of the average weekly salary or wage and the average weekly payments for the weeks ended on those dates. These figures are of special interest having regard to the recent claim of the National Union of Railwaymen for the establishment of a minimum wage of 50s. a week for all adults. For example, the weekly earnings of lengthmen, relayers, and labourers in the Permanent Way Department are officially given as 50s. 5d., 56s. 8d. and 52s. 10d., respectively. The excess of earnings over rate of pay is, of course, accounted for by the enhanced rates of payment for overtime, night duty, Sunday duty, &c. The average earnings of engine drivers and motormen are shown as 100s. 10d., or 14s. 1d. higher than their average wage; and of signalmen as 67s. 10d., or 8s. 1d. in excess of their average wage. Grade 1 porters number 2,304 and adult Grade 2 porters, 12,419; the average weekly payments are 49s. 6d. and 45s. 2d., respectively. A new grade, "porter, special," appears in the return for the first time. There are 128 such men, with an average rate of 50s. and earnings of 54s. 10d. Another new grade is that of "mobile crane driver," of whom there are 70

(average wage 58s. 2d., average payment 65s. 3d.) in the goods and cartage departments. The return provides further indication of the growth of employment afforded by the railway service of this country.

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The Chinese National Railways, 1935-1936

THE annual report of the Ministry of Railways in Nanking, published as recently as April last, contains full statistics of working of the sixteen Government-owned lines comprised in the system of the Chinese National Railways, for the 24th fiscal year, 1935/1936. The principal results of operation compare with those of the preceding period as follow:—

	1935-36	1934-35
	\$	\$
Gross receipts	171,091,505.79	167,522,106.43
Working expenses	110,270,317.24	110,736,316.52
Net receipts	60,821,188.55	56,785,789.91
Ratio of working, per cent. ..	64.5	66.1
Net revenue debits	28,522,423.32	31,023,510.26
Net revenue credits	2,778,609.09	2,083,535.58
Net surplus	35,077,374.32	27,845,815.23

The gross receipts include \$12,878,657.56 for Government transports and \$5,727,658.11 for inter-railway items, bringing the total commercial revenue down to \$152,485,190.12. Net revenue debits included \$19,931,150 for interest on funded debt, a reduction of \$4,729,642 on the previous year. During the year the Ministry had succeeded, by means of mutual concessions, in reaching a definite settlement of the loan services of the Lung-Hai and Tientsin-Pukow Railways. Against this there was an increase of some \$450,000 in the case of the Nanking-Shanghai line on account of exchange. The Peiping-Hankow, the Peiping-Suiyuan, and the Peiping-Liaoning systems led, in order of merit, the eleven railways which reported a surplus, but the five remaining lines operated at a deficit. The Tung-Si Railway is included in the report for the first time. This new line of 132 kilometres operates between Tungkuan and Sian, and is a section of the Lung-Hai system. The construction was financed by the Ministry, work began in the spring of 1933 and the line was completed for traffic in December, 1934. Other working statistics were as follow:—

	1935-36	1934-35
Kilometres of line operated ..	7,417	7,260
Train-kilometres	43,961,777	42,066,607
Engine-kilometres	75,091,176	71,849,552
Number of passengers	46,919,610	45,646,252
Passenger receipts	\$54,249,297	\$53,052,659
Average journey, km.	93	89
Tons of goods	34,364,076	32,958,893
Goods receipts	\$98,028,580	\$94,862,184
Average haul, km.	189	190

The increase of 2.79 per cent. in passengers was attributed principally to the extension of the system of through bookings. By classes, 0.46 per cent. travelled first, 2.63 per cent. second, 74.30 third and 14.28 fourth, with 2.02 per cent. excursion and season tickets and 6.31 per cent. military and other Government transports. Density of passenger traffic increased to 588,000 passenger kilometres per km. of line. Average fare was \$1.16 and rate per km. 1.25 cents, while the number of passengers per train averaged 239, varying between 541 on the Canton-Kowloon line and only 85 on the Peiping-Suiyuan. The increase in through bookings also affected goods traffic favourably. The density over the whole system was 4,643 tons per km. of line, average revenue per ton \$2.85 and rate per km. 1.51 cents. Minerals constituted 65 per cent. of the total of commercial commodities, and 37 per cent. of the goods receipts. No fewer than 16,601,871 tons of bituminous and anthracite coal were carried. Of agricultural products raw cotton and wheat brought in the greatest amount of revenue. The total number of

employees of all grades increased from 129,164 to 129,829, and total wages and allowances from \$54,587,072 to \$55,592,509.

Excluding shunting and standing in steam, engine-kilometres were 47,901,709 or 47,758 per engine owned. Coal consumption fell from 30.71 to 29.64 kg. per train-kilometre and from 17.98 to 17.35 kg. per engine-kilometre. Average fuel cost was 5 cents lower, at \$7.15 per ton. Average cost of locomotive repairs, at \$7.088 per engine owned, was higher than the average of several preceding years. In the Permanent Way Department there was a reduction in expenditure which was, in fact, the largest reduction in any departmental item of cost during the year, \$2,516 per km. of open line, comparing with \$2,806 in the previous period, a fall principally accounted for by the reduction in sleeper renewals. Net revenue accounts and balance sheets are included in the report for each of the sixteen railways comprising the National system, but as all these lines retain individually their own positions as regards bonded indebtedness, the financial position as a whole is necessarily very complex. According to the Profit and Loss account, after making all adjustments and bringing forward balances, there was an unappropriated surplus of \$40,541,127, but as there is in the balance sheet an accumulated deficit of \$136,277,232, there still remains a deficit of \$95,736,104, which, however, was \$20,737,568 less than at the end of the previous financial year. Temporary advances from the Government totalled \$146,052,543, which is an increase of \$17,368,770 over the previous period. These advances were made by the Government to the railways, either because they were operating at a loss or because of inability to meet interest payments on loan obligations. Bondholders have the first claim on the surplus, but for the current fiscal year only the bondholders of the Nanking-Shanghai Railway shared in profits to the amount of \$108,644. However, the general tone of the report is one of optimism. The surplus was the highest recorded for the previous five financial years, a result that is attributed to the settled political conditions prevailing throughout the country and the gradual recovery from the economic depression. Given continued freedom from interference, the report says, the outlook for railway operation in China is full of hope and promise; unfortunately this hope seems unlikely to be fulfilled unless the present conflict between the Chinese nation and Japan is speedily ended.

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Journey Payment Scheme

IN Great Britain, freight rolling stock for traffic intended to pass over more than one company's line is generally provided by the forwarding company. As, with certain exceptions, railway rates for merchandise traffic (other than coal class) include sums for the provision of wagons by the railway company, it follows that when the conveyance charges paid by the trader are divided between the carrying companies on the usual basis, the receiving companies are credited with sums for the use of rolling stock which they did not provide. Appropriate payments have therefore to be made by them subsequently to the forwarding company, and for very many years inter-company payments have been made under this head. Prior to 1914 the forwarding companies were compensated (except in those cases where wagon hire was raised as a separate charge and credited to those companies) for every actual loaded wagon journey on the basis of the mileage traversed on the other companies' lines, the payment varying according to the carrying capacity of the wagon. These payments were known for many years as "mileage charges." As will be readily

appreciated, this procedure necessitated the compilation and analysis of returns from every forwarding point, junction, and receiving point in respect of every wagon exchanged—operations which involved the companies in considerable expenditure for clerical work. After the war, it was felt that the expenditure in question was disproportionate with the amounts involved, and consideration was given to the possibility of introducing some scheme which, while adequately remunerating companies for the provision of wagons, would effect substantial savings in clerical work as compared with the previous arrangements.

After several experiments, what is known as the "journey payment" scheme was evolved, and introduced in July, 1923. Under this arrangement the amount payable by receiving companies to the forwarding company for the provision of a wagon was calculated on the basis of the average payments per loaded wagon journey between the respective companies in 1913, these sums being increased by certain percentages to reflect the subsequent general increase in rates and the rise in wagon building costs. The application of these average figures to the total number of wagons exchanged between the respective companies thus obviated the necessity for tracing and analysing individual wagon journeys, and enabled a substantial amount of clerical work to be eliminated. It should be emphasised, of course, that these inter-company payments make no difference to the conveyance charges paid by the traders; and that for obvious reasons, the average rate of payment per loaded wagon journey varies as between the different companies, and also as between wagons passing to and from the same companies. The flow of freight train traffic is constantly varying, however, and accordingly tests are made from time to time to establish the average distance which wagons travel on the receiving company's line. Wagon building costs also vary, and the journey payment rates are adjusted when necessary to make allowance for both factors. Similar arrangements have also been adopted in connection with the provision of wagon sheets for traffic passing over more than one company's line.

Apart from the journey payment scheme, arrangements exist for recompensing a forwarding company for the undue detention of its wagons by a receiving company. These payments were assessed prior to 1914 by a comprehensive system of returns from stations and junctions to the Railway Clearing House, by means of which individual wagons were traced. To reduce the heavy clerical work involved, the common user scheme was introduced and arrangements were made soon after the war for returns to be furnished the Railway Clearing House twice weekly of the common user wagons exchanged between the companies during the three preceding working days. These figures are then totalled and advices issued to the companies twice weekly showing the balance due to, or from, them in respect of the wagons exchanged during the preceding three days, which balance has to be paid back within the next three days. By this means a free period of six working days is allowed for the return of wagons from a receiving company, irrespective of the distance the wagon is required to travel. The majority of the wagons are thus balanced in totals instead of being dealt with individually, and demurrage penalties, in accordance with an agreed scale, are charged on the balances not paid back within the specified free period. As in the case of the journey payments, these inter-company demurrage payments merely recoup the forwarding company for the loss of use of its wagon beyond a reasonable time, and do not affect the traders concerned in any way.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Scanty Winter Timetables

55, Becmead Avenue,
Streatham, S.W.16
September 10, 1937

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—At the end of September most of the summer trains disappear, but it is encouraging that of recent years many have been kept on during the winter. It is difficult to believe, however, that on Sundays and on lines not serving the needs only of tourists, a demand for travelling should suddenly cease coincidentally with the first Sunday in October, when all the summer trains have been withdrawn. It is now more the custom to travel on Sunday than some years ago. The Southern Railway main line through Hordsham and Arundel is very badly served in winter on Sundays, there being no train down this line to Chichester, Bognor and Portsmouth from morning till late evening. A convenient summer train leaves Victoria at 2.20 p.m., and when I travelled on this on September 5, it consisted of 10 well-filled coaches. The train was obviously convenient as many people were travelling intermediately. In winter, when there is no such train, it is presumed that people despair of travelling at all, or go by Southdown bus.

Yours faithfully,

W. A. SHEPHERD

London—Cambridge Train Services

London, September 13, 1937

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—“Kingsman’s” criticisms will be endorsed by many of your readers. But is not the trouble really due to the fact that the new trains have been squeezed into the timetable where they will cause the minimum of upset to other services, whereas a *real* revision might have given us an evenly spaced-out service, at regular intervals, and so satisfied all reasonable requirements?

As to the use of King’s Cross, I am not so sure that “Kingsman’s” view is correct. In any case, even if Hitchin were made suitable for the passage of non-stop trains to the Cambridge line, high-speed trains, Pullmans, and other additions to the ordinary service must have brought the old Great Northern—with its two bottle-necks on the first 25 miles—to a point when further additions would affect the local services very seriously. It is really remarkable, whether travelling in fast or slow trains (and, I must add, punctual or unpunctual!) to see how few delays actually occur over this very difficult area, but I doubt whether the most efficient regulation could secure a clear road for additional 60- or 65-min. trains to and from Cambridge.

Yours, etc.,

R. E. CHARLEWOOD

PUBLICATIONS RECEIVED

British Locomotive Types. London, 1937: The Railway Publishing Co. Ltd., 33, Tothill Street, S.W.1. 9½ in. × 6 in. 113 pp. Price 5s.—When beginning publication, in THE RAILWAY GAZETTE of January 29 last, of our “British Locomotive Types” series of dimensioned drawings, we announced the proposal to issue the set on completion in book form. The volume under review is the fulfilment of that intention, and has also been expanded to include tube numbers and sizes, and distance between tube plates, which space precluded in the serial version. Our readers, aware of the useful data which accompanied the drawings, will appreciate the convenience of having such information available as now presented, in handy size and indexed for rapid reference. As a survey of current locomotive practice of the four groups, this publication can claim unusual completeness, and its topicality is such that particulars are included of a locomotive class of which the first example is still only in the earliest stages of construction. Moreover, besides the abundant technical information comprised in the drawings, and the tables of heating surfaces, tube sizes, and tractive efforts which accompany them, an impression of external appearance is conveyed which it will be of special interest to have on record at the present period of development in locomotive design. As to the range of types covered, the scope of the book is equally comprehensive, showing all principal classes for express, intermediate and branch line passenger

traffic, freight working, and shunting duties. Certain new types have been added since serial publication. Finally, with completeness goes a degree of authenticity which will commend the book to all students of the locomotive who indulge in debate upon details of practice. The drawings are prepared from originals supplied by the chief mechanical engineers of the railways concerned, and have been checked by competent members of their staffs.

New Zealand Railways: A Record of Progress.—This profusely illustrated 48-page publication, issued by the New Zealand Railways Publicity Department, tells concisely the story of the remarkable progress during the past twenty-five years of the railways in that country. This period, the termination of which is marked by the completion of the £300,000 new Wellington station, might be termed the period of consolidation, with, as a disturbing interlude, the appearance of road transport on a competitive scale. The first chapter in the book gives an historical outline of the evolution of the railways since the first sod was turned in 1861. Following are summaries of the far-ranging services which assure the truth of the New Zealand Railways’ motto: “Safety, Comfort, Economy.” A map of the system is appended.

Metal Rectifiers.—The remarkable extent to which the metal rectifier has found its way into practically every branch of electrical engineering is shown by the contents of three interesting booklets received from the Westing-

house Brake & Signal Co. Ltd. 82, York Road, London, N.1. “Westinghouse Rectifiers for Telecommunication” outlines the use of the metal rectifier in modern telegraph and telephone practice with the aid of an instructive series of diagrams and photographs. Telecommunication engineering has altered out of all recognition in a comparatively few years, and the metal rectifier has proved a handy instrument in obtaining the efficiency of long-distance communication today. “The All-Metal Way, 1938,” describes further uses of rectifiers, chiefly in connection with wireless sets, but including even model railways, while “At the Correct Rate” is devoted to the important subject of accumulator charging, in which rectifiers have found a large field of usefulness.

Electric Dock Trucks.—A new illustrated catalogue from Greenwood & Batley Limited, Albion Works, Leeds, shows the Greenbat range of dock type battery-propelled trucks at work upon some of the numerous duties for which their design adapts them. The trucks may be fitted with various appliances to facilitate dealing with special types of load, such as elevating and extending platforms, or barrel-handling gear. Crane trucks for high stacking of articles are also shown, and the maximum utilisation of space achieved by the compact design and full slewing of the jib are noticeable features of the illustrations. All trucks may be simply fitted with a revolving brush, forming a cheap and speedy method of keeping quays, platforms, warehouses and similar premises clean. A special point is made of the operating economy of the trucks and their labour-saving propensities—points of added importance in these days of higher wages costs.

THE SCRAP HEAP

A BRIDGE OVER THE CHANNEL

According to the *South Eastern Gazette* of January 10, 1885, a company styling itself the Channel Bridge and Railway Co. Ltd. was registered, with a capital of £200,000 divided into 50,000 shares of £4 each. The company "undertook to make and procure all inquiries and investigations, &c., necessary with a view to the construction of a bridge or viaduct over the English Channel."

SHARK CRASHES INTO STEAMER

Week-end holidaymakers on board the L.M.S.R. Clyde passenger steamer *Glen Sannox* on their way from Ardrossan to the Island of Arran, had a thrill on September 11 when a basking shark crashed into the vessel. Two panes of glass in the saloon cabin of the steamer, several feet above water-level, were broken. The vessel was in very deep water when the impact of the shark shook her from bow to stern. Many passengers thought that the ship had been in a collision.

INDIAN RAILWAY SALESMANSHIP

The Indian Railway Inquiry Committee, of which Sir Ralph Wedgwood was Chairman, and whose Report was summarised in our issue of July 2, recommends substantial development in advertising and publicity. The Committee's Report stated: "We were informed by more than one administration, that the tom-tom has been pressed into the service of the advertisement department, and we could well believe that it was effective. In some parts of Scotland, the bag-pipes have been known to attract travellers. No instrumentality, however primitive in its appeal, should be neglected." In this connection we reproduce below the cartoon which recently appeared in *The Hindustan Times*.



A "wilful" accident is to be staged on a little used section of the South African Railways, in Natal, to determine at what speed an engine will overturn on a sharp curve. An old locomotive with throttle open but no crew aboard will make successively faster dashes over the test track until it overturns. When it comes, the actual derailment will be "shot" by moving picture cameras, giving officials additional data for studying exactly what happens when a train "jumps the track."

SAVING HIS BACON

The guard of an early morning train from Portslade to Horsham one Saturday had received the "right away" and the train had begun moving out when an aged and agitated navy rushed the barrier and made for a "third." Platform staff who had visions of the old fellow "losing time," shouted, hands went up, guard whistled, heads popped out of windows and the train jerked to a standstill. The navy jumped in and immediately jumped out again—but with a smile of satisfaction on his face, for he clutched in his hand a red spotted handkerchief which obviously contained a basin and which he had left on the rack when the train arrived. The guard muttered as he waved the driver on, but joined in the general laugh, forgetting, it is hoped, to "book" a minute.—From the "Southern Railway Magazine."

The widespread interest in railway speeds this summer gives topical interest to a tabulated statement prepared by "G.J.T." and published in *Engineering* for July, 19, 1867. This showed the running of express trains to the chief towns on nine principal railways and was prepared by the writer so that readers of *Engineering* may see what progress has been made

TO THE ELECTORS OF THE BOROUGH OF DERBY.

My attention has been called to a Hand-Bill containing remarks on a meeting Mr. Bass had with the Electors at the Railway Station, on Saturday last.

In the Bill in question it is stated, "When Mr. Bass canvassed the Employees of the Midland Railway Company for their votes, they decided to vote for him; but, alas! they little thought how powerless they were, for on one of the Superintendents, Mr. Kirtley, joining in the discussion, he stated that he would not vote for Mr. Bass unless he coalesced with Mr. Beale, and THAT THE MEN MUST ADOPT A SIMILAR RESOLVE."

To this statement I give the most unqualified contradiction, and can appeal to Mr. Bass and every person present at the meeting in question, that no such remark was made.

Had I made use of any language to the effect imputed, I should have been as contemptible in the eyes of the Electors present, as I feel the man is that can make such a statement and dare not avow his name.

This is one more of those miserable attempts to prejudice the cause of Mr. Beale and to brand his supporters, especially those in the service of the Railway Company, than whom there does not exist in this kingdom a body of men more FREE to exercise their political privileges.

Your obedient Servant,

M. KIRTLEY.

April 21st, 1859.

In 1859 when the election fever was at its height at Derby, this curious handbill was issued by Mr. Matthew Kirtley, the then Locomotive Superintendent of the Midland Railway

towards the ultimatum propounded by you—60 miles an hour running speed, 50 miles an hour through speed on long journeys, including stoppages." It was added, "The Great Western Railway still holds the head of the list, though it has slowed all its principal trains very considerably this season. The South-Western, with its easy gradients, its splendid permanent way, and its admirable locomotive superintendent, only attains a through speed of 30 to 35 miles an hour."

Polar bears have been causing considerable worry to section workers on the Hudson Bay Railway, showing no fear of men in their forays for food. One group of permanent-way workers was chased by a bear and took refuge in a shack; the animal remained outside the door for six hours before it wandered off.

A conference was held on Tuesday, April 29, 1873, at the National Club, Whitehall, for the purpose of taking into consideration the effects of the railway system on the observance of Sunday. Mr. Robert Baxter was in the chair, and several resolutions were passed calling upon railway companies to diminish, if they could not abolish, the Sunday traffic.—From "The Economist" of May 12, 1873.

SUBURBAN STATION CHAT

"The 9.37 was on time again today."
"Yes, I know. I believe the world's gone speed mad."—From the "Daily Express," of September 15.

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents.)

SOUTH AFRICA

Cape Town Improvements

In an official statement issued at railway headquarters, it is stated that the Minister of Railways and Harbours and the City Council of Cape Town have agreed to the adoption of a scheme of improvement to the harbour foreshore and the goods and passenger layout. The scheme, apart from a new railway passenger and goods yard layout, provides for an entirely new passenger station fronting Adderley Street, with the building set back to provide parking areas. The south-westerly side of the new station will adjoin Strand Street instead of Castle Street as at present, and the move from the present site at Castle Street to the other side of Strand Street will be about 80 ft. further down Adderley Street. The station in its new position will permit of the extension of Strand Street past the seaward side of the castle to link up with Newmarket Street and Sir Lowry Road, an improvement that will go a long way towards relieving the traffic congestion in Adderley Street.

The total estimated cost of the scheme, including reclamation, but excluding costs of streets and municipal services for the newly reclaimed area, will be £2,892,710. Of this amount the City Council will contribute first a lump sum of £250,000, and secondly an amount of £257,000, representing its proportion, namely 40 per cent. of the cost of overhead bridges and subways. Against its proportion of the total cost, the railway administration will have available for sale or for retention for railway purposes an area of land totalling 5,197,160 sq. ft. Before any of the railway improvements enumerated above can be taken in hand, sufficient ground will have to be reclaimed to accommodate the new goods layout, as the site of the existing one is required for the new passenger station.

Tourist Traffic

In the annual report of the Publicity and Travel Manager, it is stated that the number of visitors to the Union had increased from 10,363 in 1934 to 35,270 in 1936. While the increase was partly due to the Empire Exhibition, it was also considerable during other months. The steadily maintained publicity campaign and the improved nature and wider contribution of its propaganda are now definitely bearing fruit, and world travellers and business men are becoming increasingly aware of the distinctive appeal and potentialities of South Africa. The extent to which the department widened its campaign during the year may be gathered from the fact that issues of literature increased from 195,000 in 1935-36 to

765,000 for the past year, a figure that, taken in conjunction with the number of joint publications undertaken with the assistance of various municipalities, brings the total issue to 1,485,000 as against 403,000 in the previous year. The activities of the tourist branch of the department continued to expand, and a marked increase was recorded in the volume of business at all branches.

Financial Results

The results of working for the three months April to June show a revenue surplus of £165,440 over expenditure after allowing for special appropriations of £250,000 to Betterment Fund, £121,750 to deficiency in Pension and Superannuation Funds, £250,000 to Rates Equalisation Fund, £62,500 reduction in branch line capital, £462,500 to Renewals Fund, £186,609 responsibility allowance, £125,000 to writing out of capital discount and expenses on pre-Union capital and £59,347 to writing out of capital account residual value of sleeper plantations. Revenue from transportation services only for the period totalled £8,052,039, an increase of £504,168 on the previous year. Working expenses increased from £4,926,845 to £5,315,381.

RHODESIA

Improved Railway Earnings

For the first six months of the current financial year, the total earnings of the Rhodesia Railways were £2,586,548, an increase of £432,234 over the comparable period of the previous year, while the net operating revenue at £1,135,211 was £322,735 more. While the tonnage carried of coal, chrome, copper, zinc and asbestos has increased by 177,000 tons—roughly 35 per cent. higher than last year—the increase in traffic is by no means confined to minerals. General goods, particularly imports via Beira, show a large increase over last year, and passenger traffic is also higher.

The second six months of the year are likely to show even more favourable results judging from the details published for April, May and June tonnages. All previous records were eclipsed at Beira during June, when the tonnage landed and shipped totalled 122,367 harbour tons, which was particularly remarkable as there was no export of maize. With the beginning in August of the raling of this year's maize crop from Rhodesia to Beira, the Rhodesia Railways will, in the next few months, be faced with an exceptionally heavy volume of traffic. In addition to the traffics mentioned, there is, with the relaxation of foot and mouth disease restrictions, a much greater movement of livestock, and the

export of live cattle from Southern Rhodesia to the Johannesburg markets has been resumed.

New Rolling Stock

With the increasing traffic over the Rhodesia Railways, it has become necessary to place several orders for new engines and rolling stock. Of the former, Beyer Peacock & Co. Ltd. is supplying six Garratt locomotives of the 2-8-2 + 2-8-2 wheel arrangement, similar in design, except for minor modifications, to the existing eight "16th" class engines which were placed in service in 1930. The existing engines of this type, with a tractive effort of 46,200 lb., are used on the steeply-graded section of the main line between Salisbury and Umtali, carrying the heavy export traffic to Beira.

Due to the rapid rise in the petrol and fuel oil consumption in the Rhodesias, and to the diversion of the importation of this traffic in bulk through Beira, it has been found necessary to provide additional tank wagons. Orders have been placed in England for 27 of these vehicles, 18 each with a capacity of 7,000 gall. for petrol, and nine 6,000-gall. fuel-oil tank wagons.

Other orders placed in England are for three passenger baggage and guards' vans, and for 150 steel high-sided bogie trucks of 42½ tons capacity.

INDIA

New Quadri-composite Coaches

The recommendation of the Wedgwood Committee in the matter of effecting a reduction in the first class accommodation provided on Indian trains has been anticipated on the Eastern Bengal Railway. This administration has recently put into service a new design of quadri-composite carriage in which accommodation is provided for all the four classes of passengers. The accommodation in this type of carriage consists of a coupé first, an ordinary second, a small inter, and a large third class compartment. The "wastage" of upper class accommodation on trains, referred to in the Wedgwood report, is considerably reduced in the new design. Moreover, the adoption of the quadri-composite design has enabled through carriage facilities to be extended to all classes of passengers. Hitherto, it has been the practice to provide a composite first and second class carriage on certain trains for through service between branch and main lines.

Some existing coaches on the E.B.R. have already been converted to the quadri-composite design, and the completion of the new stock, recently sanctioned, will permit of the extension of these four-class facilities to all branches of the railway on which through carriages are run.

The E.B.R. administration has also under contemplation the introduction of a tri-composite carriage to run on branch line trains in place of the first and second class composites now in use.

This will enable the railway to bring the upper class accommodation available on trains nearer the actual requirements for that class of traffic, and thereby increase the lower class accommodation.

Wedgwood Report Discussion

Sir Sultan Ahmed, Acting Member for Railways and Commerce, replying to a question, informed the Central Legislative Assembly that the report of the Railway Inquiry Committee would be considered in the Assembly on August 27. On certain of its recommendations relating to the technical aspects of railway administration, the Railway Board was already taking action, but the major issues of policy were still under the consideration of the Government of India. Discussion in the Assembly would enable the Government to hear the opinions of members before arriving at their decisions. The Government had already received the minute, approved by the majority of members of the Public Accounts Committee, containing that committee's recommendations and opinions regarding the report. The attention of the Standing Finance Committee for Railways was invited to such portions of the report as were relevant to the business before the committee at the meeting at Calcutta on June 29. Any proposals for expenditure arising out of the report, in regard to which the committee would be consulted in the ordinary course, would be referred to it. In the circumstances, the Government did not consider it necessary to refer the report as a whole to the committee before discussion in the Assembly.

Bihta Accident

The Railway Member informed the Assembly that the cause of the railway accident at Bihta had not yet been determined and was still under investigation. The Government had under consideration the report of the Senior Government Inspector who had inquired into the disaster. The question whether any other inquiry should be held would be decided when the Government came to a final conclusion on the inspector's report. [See also later news paragraph on page 491.—Ed. R.G.]

CHINA

Paochi-Chengtū Railway

The preliminary surveys in connection with this line have now been completed and the final alignment selected. It runs from Paochi, the present western railroad of the Lung-Hai Railway, via Fenghsien, Liupa, Paocheng, and Ningkiang (in south-western Shensi), and onwards via Kwangyuan and Chaohwa (in northern Szechwan) to the capital of the Province. A Sino-Belgian loan is reported to have been arranged for the supply of materials and equipment for this new line, and if

the war does not prevent it by absorbing all available funds, construction work is likely to begin in October. The permanent bridge over the Wei River on the Sian-Paochi section of the Lung-Hai line has now been completed.

Plans for Beginning Work on Other Constructions

Other new railways upon which construction work was to have been begun this autumn are the Canton-Meih sien and Meih sien-Chaochow lines, in Kwangtung; the Hunan-Kweichow; the Hunan-Kwangsi; the Shohsien-Kweihua (connecting the Tatung-Puchow and Peiping-Suiyuan Railways and the Provinces of Shansi and Suiyuan); and the northwestern extension of the Hwainan Railway to Yekiachi (in western Anhwei near the Honan border). The effect of the war on these projects is as yet unknown, but it seems probable that funds for other than military lines will be very limited.

ITALY

New Railway in Sicily

During his recent visit to Sicily Sgr. Mussolini opened a new chord line from Alcamo to Trapani in the north west of the island. The former railway between these points made a wide detour southwards via Castelvetro, Mazara, and Marsala, a distance of 195 km. (120 miles), whereas the new direct line is only 123 km. (76 miles) in length. The contractors for the construction were Società Anonima Costruzioni Essercizii Ferrovie di Rome, who carried on the work continuously day and night. To make this possible a special high tension feeder was run

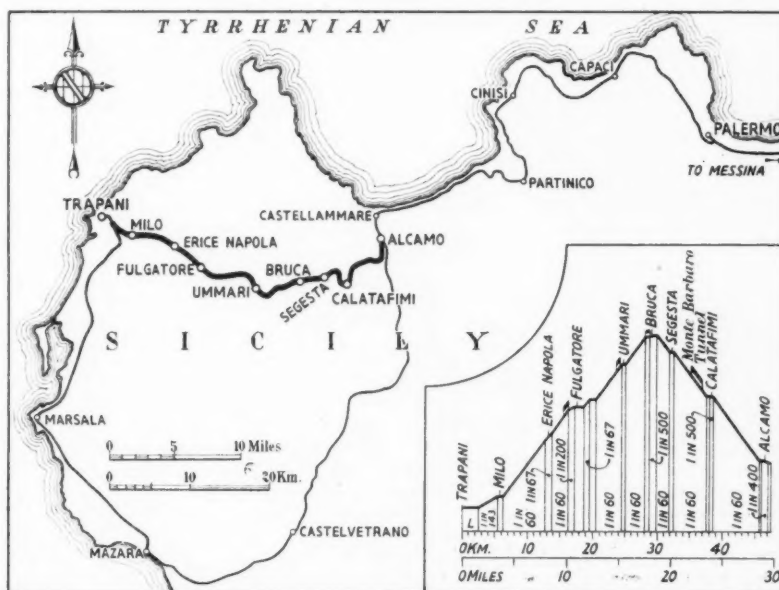
out to carry current for the low tension electric system providing light and power for the machinery used.

The ruling gradient of the new line is 1.7 per cent., or roughly 1 in 60, and curves as sharp as 500-m. (25 ch.) radius are used. From the junction near Alcamo the line rises through 220 m. (722 ft.) in the first 18 km. (11 miles) to reach the summit near Bruca station, 288 m. (945 ft.) above sea level, almost entirely on 1 in 60 grades. The remainder of the line is a broken descent to Trapani, which is practically at sea level. Seven viaducts had to be built, the longest consisting of 16 15-m. (59-ft.) arches, and there are also 10 tunnels, the most important being the Monte Barbaro, 1,620 m., or just over a mile in length, which runs beneath the Greek theatre at Segesta. As well as a new station to serve Alcamo there are seven intermediate stations. The new line which has cost 130,000,000 lire (about £1,372,000 at current rate of exchange), completes a direct line of railway from Palermo westwards along, or roughly parallel to, the north coast of Sicily throughout its length.

VICTORIA

Reconditioning Fishplates

Very satisfactory results have been obtained by the Government Railways in the reconditioning of fishplates by an unusual method. Pieces of spring steel 4 in. in length and of varying thicknesses are welded on to the top of the fishplate and their outer ends ground to form a taper. This process costs only 1s. 3d. a pair of fishplates, and greatly increases the life of the rails, reduces maintenance expenditure, and improves the running.



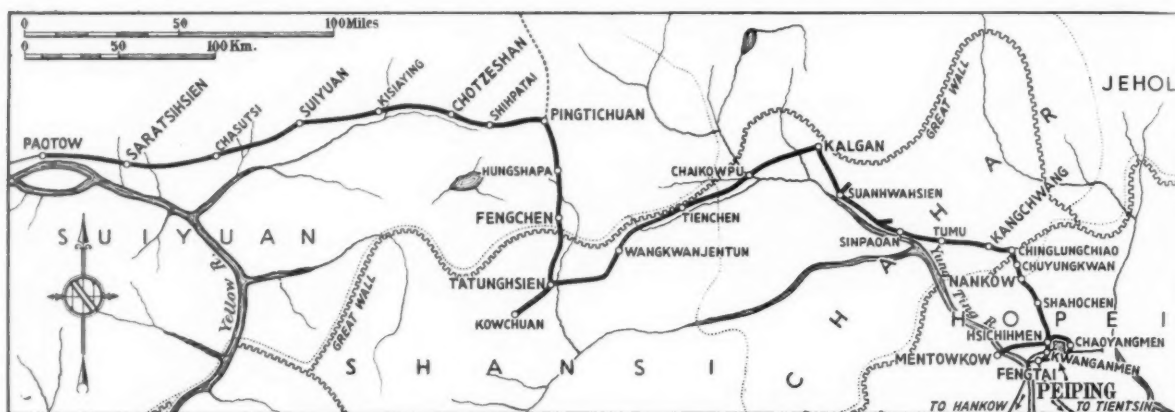
Sketch map showing the newly opened Alcamo-Trapani line in Sicily, together with its gradient profile

PEIPING-SUIYUAN RAILWAY

By virtue of its hill section and its being the earliest line financed, constructed and operated by the Chinese, this system and its extension to Paotow are noteworthy among Chinese railways

THE Peiping (Peking)—Kalgan—Suiyuan—Paotow line is the first section of a future through route to the far north-west of China and outer Mongolia; it is of standard gauge and 816 km. (507 miles) in length. The Nankow Pass hill section, 30 km. long, has a 1 in 30 ruling gradient uncompensated for curvature, and curves as sharp as 600 ft. radius. It is worked with Mallet locomotives, which with tender weigh 285 long tons. The line rises from 239 ft. above sea level at Fengtai (Peiping) to 5,304 ft. altitude at Shihpatai,

ture, which is therefore equivalent to about 1 in 27 on the straight; it then falls 206 ft. in the succeeding 6.3 miles to Kangchwang with no steeper gradient than 1 in 118. It is these 18½ miles of line from Nankow to Kangchwang that are known as the Nankow Pass hill section, and in it there are 51 curves aggregating 6.51 miles in length. At Chinglungchiao a reversing station was found to be necessary in order to attain the required altitude of 1,959 ft. at the summit a mile beyond. Transition curves 150 ft. in length are used, with 800-ft. curves and sharper.



Sketch map of the Peiping (Peking)-Suiyuan Railway in North China

549 km. distant, and then descends to Suiyuan and Paotow which are both about 3,500 ft. above the sea. Temperatures of -30° F. have been recorded at Shihpatai.

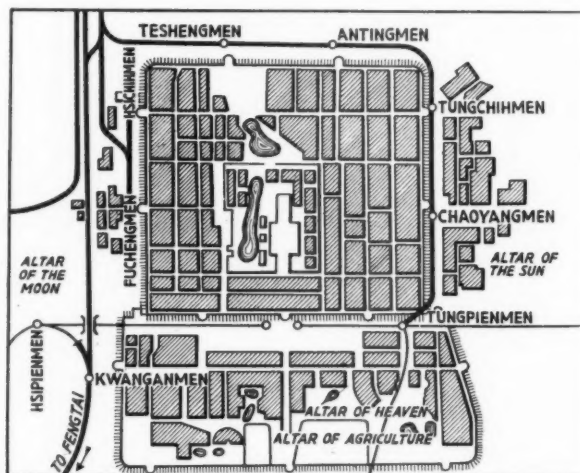
History

Construction was begun from Fengtai, a south-western suburb of Peiping, in October, 1905, and the first 55 km. to Nankow were opened in the following September. By September, 1909, Kalgan was reached, and after delays due to the revolution, platelaying was carried to Fengchen (428 km.) by September, 1915. The European war put a stop to further work on the main line, but, in addition to the Mentowkow branch (26 km.) previously constructed from Peiping, three other short branches were then built, including the "circle" line round that city to connect with the Peking—Mukden (Peiping—Liaoning) Railway. Work beyond Fengchen began again at the end of 1919, and was completed to Suiyuan (668 km.) in April, 1921, the official opening taking place on May 1. The Paotow extension was finished in 1923, the terminus being 816 km. from Fengtai; this extension was, however, never properly completed and much work is at present being done and has still to be done upon it in the near future to bring it up to a reasonable standard.

Details of Alignment

In the initial 34 miles, to Nankow the ruling gradient is 1 in 100, and sharpest curve 1,000 ft. radius, but in the next 12.2 miles the line rises through 1,644 vertical feet with a 1 in 30 ruling grade uncompensated for curva-

Throughout the whole of the remaining 328 miles (528 km.) from Kangchwang to Suiyuan there is no steeper gradient than 1 in 100, and, though there are some 795 ft. curves in the length to Kalgan, 72 miles (116 km.) from Kangchwang, there are no others sharper than 1,000 ft. radius. On the Suiyuan—Paotow extension 1 in 400 is



Plan of the City of Peiping with its railway connections. The heavy lines denote the Peiping-Suiyuan lines

the maximum grade and 3,000 ft. rad. the most severe curve.

Many parts of the line run parallel to and between barren hills and rivers, one of the worst possible conditions for flooding, and great trouble was at first experienced from this cause. Protection works have had to be undertaken over long lengths of line, and take the form of stone pitching either dry or in cement mortar, concrete blocks connected together with iron cramps, rubble walls in lime mortar, or willow piles and willow or wire mattresses filled in with rubble. In some cases also steel sheet piling was used, and protecting spurs were also thrown out in threatened places. Where protection was of no avail, re-alignment was resorted to on a considerable scale, the new sections of line being built to a much better general standard.

Permanent Way

Generally speaking, the main line and principal running loops are laid with 85-lb. rails*; and branch lines, other loops and sidings with 60-lb. material. There are, however, about 60 km. of 70-lb. and 75-lb. section track in the main line, and, in addition, the new diversions put in to avoid flooding are laid with 90-lb. material. The 85-lb. rails are of Sandberg or of the old British Standard (flat-footed) section. The 60-lb. material is of either Old Sandberg, New Sandberg, or U.S.A. section. The rail length is in almost all cases 30 ft., and L-section fishplates and dog spikes are standardised. Bearing or tie plates are used only in the Nankow Pass, and untreated wooden sleepers 6 in. \times 9 in. \times 8 ft. are used throughout the line, normally 13 to each 30-ft. rail length.

In the Nankow Pass, however, joint sleepers are 7 in. \times 9 in. \times 9 ft. There are four 9-ft. (joint) sleepers and 12 8-ft. sleepers in each rail length. To prevent creep on these steep grades an extra angle-type fishplate is bolted to the outside of each rail at its mid-point—opposite the joint in the other rail, as joints are staggered—and spiked to the two joint sleepers.

Oregon pine is used mainly and has a life of about eight years, but renewals have been allowed to fall into arrears, with the result that only low speeds varying from 10 to 25 m.p.h. are now permitted. Re-sleepering, extra ballasting, and re-aligning are now in hand in the worst lengths, and where this is completed 30-m.p.h. speeds are allowed. Ballast is mainly of gravel or broken stone and has a top width of 10 ft. and, though there are supposed to be from 6 in. to 8 in. under the sleepers, there are actually only 3 in. to 5 in. in many localities.

Bridges and Tunnels

Girder spans vary from 110-ft. half-through Warren, and 100-ft. deck Warren trusses, to 10-ft. I beams, and arches are from 10 ft. to 40 ft. in span, of the plain concrete spandrel-filled type. In 1933, however, it was decided to adopt reinforced concrete beam-and-slab spans for bridges up to 20 ft., and to replace the steel girder spans with these. There are four tunnels on the Nankow Pass section, 3,580 ft. (at the summit), 1,204 ft., 463 ft., and 150 ft. in length. The three shorter ones are all on 1 in 30-33 grades; and are all or partly curved. The summit tunnel has concrete arch and side walls, and the others concrete arches and rubble sidewalls. Their height is 16 ft. and maximum width 15 ft. at arch springing.

Stations and Signalling

There are 64 stations on the main line; 12 of these are of various larger types and have watering, or watering

and engine-changing arrangements, running sheds, etc. The principal workshops are at Nankow, and the smaller ones at Kalgan. All main line stations, except four in the Nankow Pass, have home and distant signals interlocked with the outermost points. Prior to 1931 only four stations had any fixed signals at all, so that much progress has been made since then. The hand staff and link system is in force throughout, except in the Nankow Pass, which is electrically controlled. In fact, great strides have lately been made in the rehabilitation of the whole line, particularly as regards resleepering and improvement works, and every effort has been made to bring it up to a fair standard of equipment and maintenance.

Operation

The working of the main line is limited entirely by the capacity of the Nankow Pass section, where speeds must not exceed 10 m.p.h. As many as 31 up and 31 down trains have been worked through the pass, but due to the disturbed state of the country (prior to the present war), the number was about 23 each way daily. (The line traverses the Provinces of Chahar and Suiyuan, which have now been invaded by the Japanese army from Jehol.) In addition to catch sidings at stations there are seven outside station limits, each attended day and night by two men working in shifts. Control over descending trains is insured by their having to stop outside each of the seven stations and just short of each outlying catch sidings. These trains therefore are no faster than those ascending the grades, and, as will presently be shown, their limiting loads are also lower in certain cases. The electric staff and tablet is used for train running control.

Trains from Peiping are usually split up into two or more parts at Nankow, and each part is pushed in rear by a powerful Mallet locomotive as far as the reversing station at Chinglungchiao. Thence over the summit to Kangchwang it hauls the part-train, which is again united to its counter part at that point. In the opposite direction also, trains from Kangchwang to Nankow run in two or more parts, a Mallet at the head of each part over the summit to the reversing station, where it runs round, and continues in that position down the steep grades to Nankow; the two parts are re-combined at Nankow to proceed to Peiping as one train.

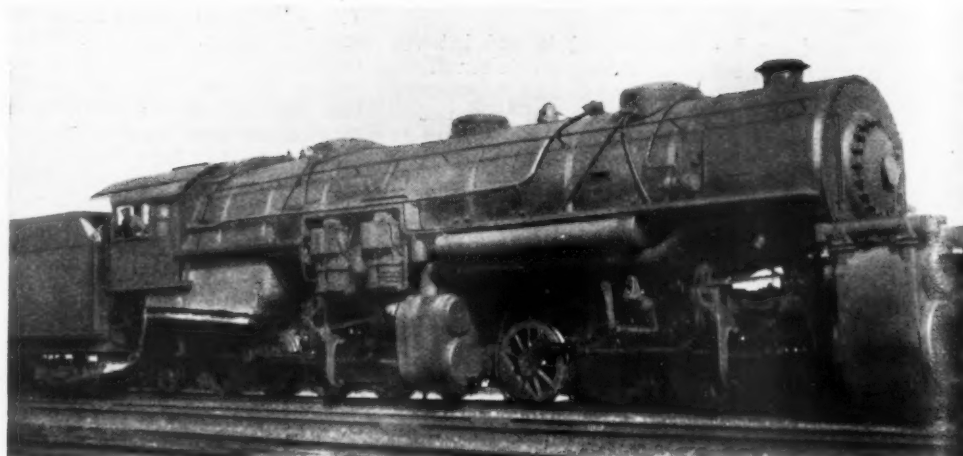
The most powerful type of Mallet in use on this line (a 2-8-0-0-8-2) is allowed to take 260 tons up the grade and 400 tons down if the train is completely braked by air and hand brakes. With hand brakes only the figures are 230 and 350 tons; trains without air or hand brakes must not exceed 200 tons ascending and 120 tons descending. These tonnages are however reduced by 10 per cent. from November 21 to March 20 each year. Other types of Mallet are limited to considerably lighter loads.

As many goods vehicles have no effective air brakes, a descending train often consists of only one or two 40-ton wagons and a brake van, and a 600-700-ton train from Kalgan to Peiping frequently has to be split up into five or six parts. Consequently, though there are only from 8 to 12 trains a day over the remainder of the main line, these may entail some 44 to 56 a day through the pass.

Any further extension of this railway westwards, or other reason for appreciably increasing its traffic, will necessitate drastic measures to permit of the movement of greater tonnage between Nankow and Kalgan, and *vice versa*. Various schemes have been investigated, and these vary from doubling the number of crossing stations to electrification and complete reconstruction in the form of a long and very costly deviation. It is said that the latter could secure a 1 in 200 ruling grade, but there is

* Those on the 1 in 30 Nankow Pass section are all sorbitically treated.

Latest P.-S.R. type
of 2-8-0 + 0-8-2
Mallet compound
locomotive, with 24 in.
and 38 in. \times 28 in.
cylinders and weigh-
ing with tender 285
tons in working
order



The Great Wall of China close to Chinglungchiao station, in the Nankow Pass, where the P.-S.R. crosses it. Some of the fiercest fighting in the present hostilities has been taking place near this spot for possession of the pass

little chance of funds being available for so ambitious an undertaking in the near future. Meanwhile, improvement of the braking efficiency of both home- and foreign-line rolling stock is being gradually achieved.*

Locomotives and Rolling Stock

On the Nankow Pass section, a Shay and three types of Mallet locomotive have been used. Their principal dimensions are set out in the following table. Now, however, only the two larger Mallet types are in regular service. Owing to weakness of track elsewhere, these engines cannot run except between Nankow and Kangchwang.

Type of locomotive	Shay	British Mallet	Mallet	Mallet
Wheel arrangement	0-4-4-0	0-6-6-0	2-8-8-2	2-8-8-2
Number of each type	6	4	7	7
Date	1909	1908	1914	1922
Diameter of driving wheels, in.	40	51	50	50
Cylinders, diameter, in.	15	h.p. 18 l.p. 28	h.p. 20 l.p. 32	h.p. 24 l.p. 38
stroke, in.	17	28	26	28
Boiler pressure, lb. per sq. in.	200	200	200	220
Fire grate area, sq. ft.	38.8	45.1	59.6	95
Heating surface, total, sq. ft.	1,904	2,591	2,626	5,538
Heating surface, superheater, sq. ft.	—	—	565	1,433
Weight in working order, long tons:—				
Engine	78.69	96.5	129.4	199.09
Tender	30.49	40.9	55.8	86.02
Tender capacity:—				
Water, U.S. gallons	3,266	4,000	6,000	10,000
Coal, tons	6.5	5.5	10	16
Maximum tractive power, lb.	44,115	46,407	54,357	92,500

As will be seen, the 1922 Mallets are exceedingly powerful engines; these fine locomotives were built by the American Locomotive Company.

Many of the air-braked P.-S.R. passenger and goods vehicles went astray during the various wars and have never returned. There are, however, about 500 goods wagons varying from 10 to 40 tons capacity and of several types and original owners, and also 60 coaches.

The Nankow Pass has of recent years become increasingly popular with tourists, as a remarkable view of the Great Wall is obtainable from it. At Chinglungchiao station it is quite near the line. Observation cars are attached to certain trains in such a position that when the Mallets are pushing these trains up the grade, they are the leading vehicles, affording an admirable view of the fine country traversed. (See editorial note on page 462.)

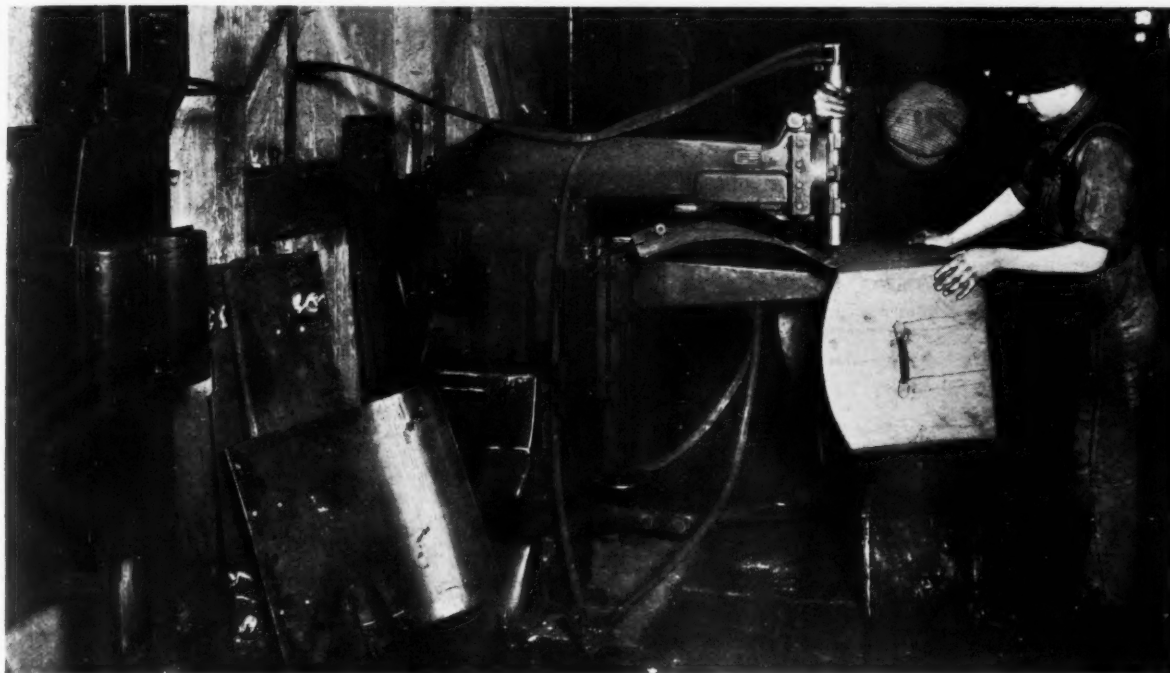
* Remarks written before the present war.

ELECTRIC SPOT WELDING AT DONCASTER WORKS, L.N.E.R.

ELECTRIC spot welding is an operation which has made considerable progress in railway locomotive workshops during recent years, and the machine we illustrate is suitable for welding iron and mild steel up to an added thickness of $\frac{3}{8}$ in. It may also be used for brass and aluminium sheets up to an added thickness of $\frac{1}{4}$ in. Manufactured by British Insulated Cables Limited, of Preston, Lancs., it was supplied to the London & North Eastern Railway works at Doncaster.

trical trip switch is fitted. At the top of the back rod an adjustable spring is provided to enable the trip switch to "make" the circuit at any required mechanical pressure, and "break" it with a slight addition of pressure. The primary winding of the transformer is fitted with tapplings connected to an enclosed plug box, from which eight different heating speeds may be selected according to the added thickness of the weld.

The machine is shown in the illustration at work on



Spot welding machine at Doncaster, L.N.E.R.

The machine consists of a single-phase static transformer having a capacity for spot welding purposes of 30 kW., and the arms or stakes are made 36 in. long to deal with certain specific requirements at Doncaster. The top arm is rigid, with a vertical moving electrode holder working in a suitable slide at its extremity. Current is conducted from the stake to the electrode holder mainly through a flexible copper connection, and partly through the slide itself, the former obviating all risk of arcing and undue wear on the sliding surfaces. The electrode is adjustable in its holder to enable the machine to deal with the various thicknesses of material within its capacity.

Operation is by pedal, whence motion is transmitted to the electrode holder through a steel back rod with top adjustment, and then through a steel top rod having a bell crank joint at the back end, and a toggle joint at the other. By this arrangement, the mechanical pressure applied to the material to be welded can be regulated to meet any requirements.

Side movement is provided to the top electrode by a swivelling arrangement embodied in the carrier, and vertical and horizontal adjustments are arranged for the bottom stake. The electrodes are water-cooled, and renewable copper electrode tips of varying shapes can be changed as required. At the back of the machine a suitable elec-

trical trip switch is fitted. At the top of the back rod an adjustable spring is provided to enable the trip switch to "make" the circuit at any required mechanical pressure, and "break" it with a slight addition of pressure. The primary winding of the transformer is fitted with tapplings connected to an enclosed plug box, from which eight different heating speeds may be selected according to the added thickness of the weld.

The machine is shown in the illustration at work on

a locomotive toolbox, which is made complete without drilling or riveting; other items also seen ready for spot welding are cab wind doors and firehole door leg guards. In addition to the items shown, such details as cab rain shields, boiler mounting plates, splashers, parts of boiler lagging, and various light metal parts may be fabricated or part fabricated on this machine. Although in most cases the work undertaken by the spot welder was previously performed by apprentices, a considerable reduction in floor-to-floor times can be made in the actual assembly of the parts, while drilling is eliminated almost entirely and there is the additional saving in material by the absence of rivets. The average cost of production of the articles mentioned as typical has been reduced by approximately 30 per cent.

In addition to the machine above described, there is in use at Doncaster works another spot welding machine made by British Insulated Cables Limited. This is the No. 90 automatic power driven spot welder, designed for welding mild steel up to $\frac{3}{8}$ in. added thickness, giving a weld $\frac{1}{2}$ in. in diameter. This machine is fitted with the maker's patented automatic relay, whereby the weld is made irrespective of the skill or judgment of the operator. Machines of this type are used for general construction work where the greatest strength is required.

ENGINEERING WORKS AT EARLS COURT

To carry the new exhibition building over the railways, and to connect it with the Earls Court station of the London Passenger Transport Board, involved much notable engineering work here briefly described

EARLS COURT EXHIBITION has a twofold railway interest, for not only is the site owned by the London Passenger Transport Board, but also important railway works had to be carried out in order to make possible the erection of the new exhibition building which is being opened this month. For many years past the Metropolitan District Railway had been interested in the site through its associated company, Earls Court Grounds Limited, and on the formation of the London Passenger Transport Board this company and its properties were taken over.

The new exhibition building occupies a triangular site of 12 acres in the angle formed by the Putney and Ealing lines of the London Passenger Transport Board. It is built partly over these lines, of which the down Putney and up Ealing are double and were in open cuttings, while the up Putney and down Ealing were single lines in tunnel. The former, which flies over the latter, is in a cut-and-cover tunnel, and the down Ealing is in a brick built egg-shaped tunnel at a considerably greater depth. Before work on the new building could be begun it was necessary to cover in all the open portions of the lines. Under the larger part of the main building mass concrete retaining walls with a roofing consisting of steel joists at 7-ft. centres with concrete filling were used. The joists had a concrete ledge cast on their lower half before erection so that precast concrete slabs could be placed on them to span the gaps when they were in position. This avoided the necessity of ordinary shuttering to support the main reinforced roofing.

The areas under the forecourts near Warwick Road and Richmond Road were covered over with plate girders carrying secondary beams and filler joists. Parts of the exhibition building also were supported on this steelwork, but where building loads were carried special girdering was provided and walls and foundations increased in thickness where necessary to spread the loads. In such places the walls were built in sections with expansion joints between them, and the outline of the foundations was varied to bring the centre of gravity of the loads over that of the foundations. It was necessary in places to project the toes of the walls in reinforced concrete under the ends of the sleepers, and in two places voids were left at the back of the walls to reduce the loading on the ground.

The foundations were generally on ballast, but at the site of the new escalator (mentioned later) near Warwick Road bridge the concrete wall was taken down to a greater depth as a precautionary measure and founded on hard blue clay. In places the remains of a puddle clay trench 3 ft. wide, thought to be the remains of old canal works, were found on the site of the foundations. This puddle clay was dug out and replaced by ballast passed through the mixer and rammed to simulate as far as possible the surrounding ballast of the foundation. Generally the filling at the back of the walls was 20 to 1 concrete as a precaution against the sinking of the forecourts of the exhibition. The thickness of these walls was reduced by reinforcing them and using the reinforced concrete deck as a strut.

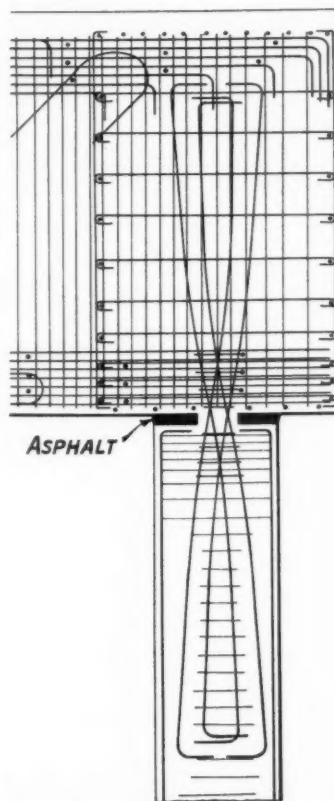
Expansion joints were formed in the forecourt with

copper strips and bitumen filling between. To allow for the expansion of the steelwork the secondary beams at the joints were designed to rest on shelves on the main girders to which they were not bolted so as to be free to move with the concrete decks. Slots were left in the concrete covering of the main girders to permit this expansion.

To obtain a symmetrical layout of the main columns in the exhibition building, a form of portal beam had to be constructed over the tunnels to carry certain of the columns, the largest of which, supporting the main roof of the building, measured no less than 56 in. square and carried a load of 2,050 tons each. In all, 62 of these beams were constructed in reinforced concrete and carried an average load of 850 tons each. They varied in size up to the largest, adjacent to the fly-over junction, where it was impossible to construct a foundation of adequate size between the two tunnels and hence the beam had to span them both. This beam is reputed to be the largest of its type in the world and has a clear span of 97 ft. carrying a total load (exclusive of its own weight) of 3,860 tons. The beam itself measures 104 ft. long by 9 ft. 9 in. deep and 18 ft. 6 in. wide, and weighs 1,400 tons. It has 278 tons of reinforcement in it consisting of 362 2-in.

round steel bars 90 ft. long top and bottom.

A minimum clearance of 8 in. was left between the top of the tunnels and the underside of the beams. The shuttering used in the construction of the beams was carried on long steel joists spanning clear of the tunnel to ensure that the weight of the beam itself should not be taken by the former. A feature of these concrete beams is the special type of hinge joint between them and their supporting columns, designed to prevent heavy bending stresses being set up in the latter due to the deflection of the beam. As the bearing pressure of the subsoil, consisting of ballast and blue clay, was limited to a conservative figure, and the loads from the columns were very high, foundation bases were necessary up to 30 ft. square or more,



DETAIL OF HINGED JOINT

and great care had to be exercised in shoring up the sides of the tunnels when excavations were made alongside them. Certain of the foundations had to be carried lower than or under the tunnel footings. In every instance the new foundations were made deep enough to ensure that the pressure from them should not be transmitted through the ground to the side walls of the tunnels.

The new exhibition building itself is a remarkable structure and is said to cover under one roof the largest area of any building in the world. One side of the building is 900 ft. long and the other two about 700 ft. It is surrounded by spacious approach grounds and wide private roads to facilitate access by motorists, and a large car park has been provided between the new building and the neighbouring Empress Hall. The new building is constructed entirely of reinforced concrete, with the exception of the main roof trusses which are in the form of 250-ft.-span steel lattice girders placed at 50 ft. centres and weighing approximately 80 tons each. The clear height from the floor level to the underside of the roof trusses is 110 ft.

The western boundary of the triangular site upon which the new building has been erected is formed by the West London Extension Railway beyond which is the Lillie Bridge depot of the L.P.T.B. A footbridge giving access to the Empress Hall spanned the W.L.E.R., and this has been removed and replaced by a new two-storey bridge approximately 150 ft. wide. It is constructed of plate girders, spanning the railway and the depot, and carried on reinforced concrete columns. The superstructure also is of reinforced concrete. The lower floor of the bridge forms a carriage way to the new car park on the other side of the railway, while the upper floor has been designed for use as a store. The excavations for some of the bridge column foundations had to be taken through 12 ft. of mud which formed the bottom of an old canal on the site of which the W.L.E.R. was built. The depth of some of these columns below rail level is about 23 ft. The car park has been formed over part of the Lillie Bridge depot, including a length of the old car sheds which were removed for the purpose.

To cope with the heavy traffic expected in connection with the new exhibition a new subway with escalators, connecting Earls Court station with the exhibition site, has been built, and the old timber-covered passage way or gallery from the station to Warwick Road, opposite the main entrance to the exhibition, has been replaced by a new and wider gallery formed to the north of the old one. The site of the latter is being reserved for the construction of an additional subway from the station should traffic in the future necessitate it. The old footbridge connecting the platforms with the former gallery has also been demolished and replaced by a new steel and brick structure. The new gallery which is 15 ft. wide is steel-framed, with brick filling to the roof on one side and on the other a brick parapet above which it is open to the line. Welsh pressed facing bricks are used for the walls, and the floors and roofs are of precast slab construction, the latter covered with asphalt. The floors of the public spaces are laid with standard L.P.T.B. 12 in. x 12 in. concrete tiles, and of the staff rooms with coloured asphalt.

The Warwick Road end of the new gallery, opposite the main entrance to the exhibition, opens into a circular hall 32 ft. in internal diameter containing ticket booth, shops for a newsagent, a tobacconist and a confectioner, public telephones, a ticket-bag repair shop, a switch room, and lavatories for the staff and tenants. The exterior has a publicity pylon with a bullseye mast sign and generally carries the usual Underground station names and other features. The parapet wall of the Warwick Road bridge over the railway adjoining this entrance has been

built in the form of an advertisement hoarding in reinforced concrete carrying four 48-sheet bills.

At the footbridge end of the new gallery, in a hexagonal-shaped hall, there is a battery of three special ticket booths for use when the exhibition is open. There is also an auxiliary ticket office, a clerk's room and a switch room in this hall. The new footbridge first provides access by stairway to platforms 3 and 4, and continues at a width of 15 ft. to the stairway leading to platforms 1 and 2. Thence there is a 9-ft. wide continuation to the office of the Board's Signal Engineer, and beyond to a gallery leading to the entrance in Earls Court Road.

The old umbrella roofs over the west end of the platforms have been replaced by a steel structure the stations of which are encased in concrete; the roofs are

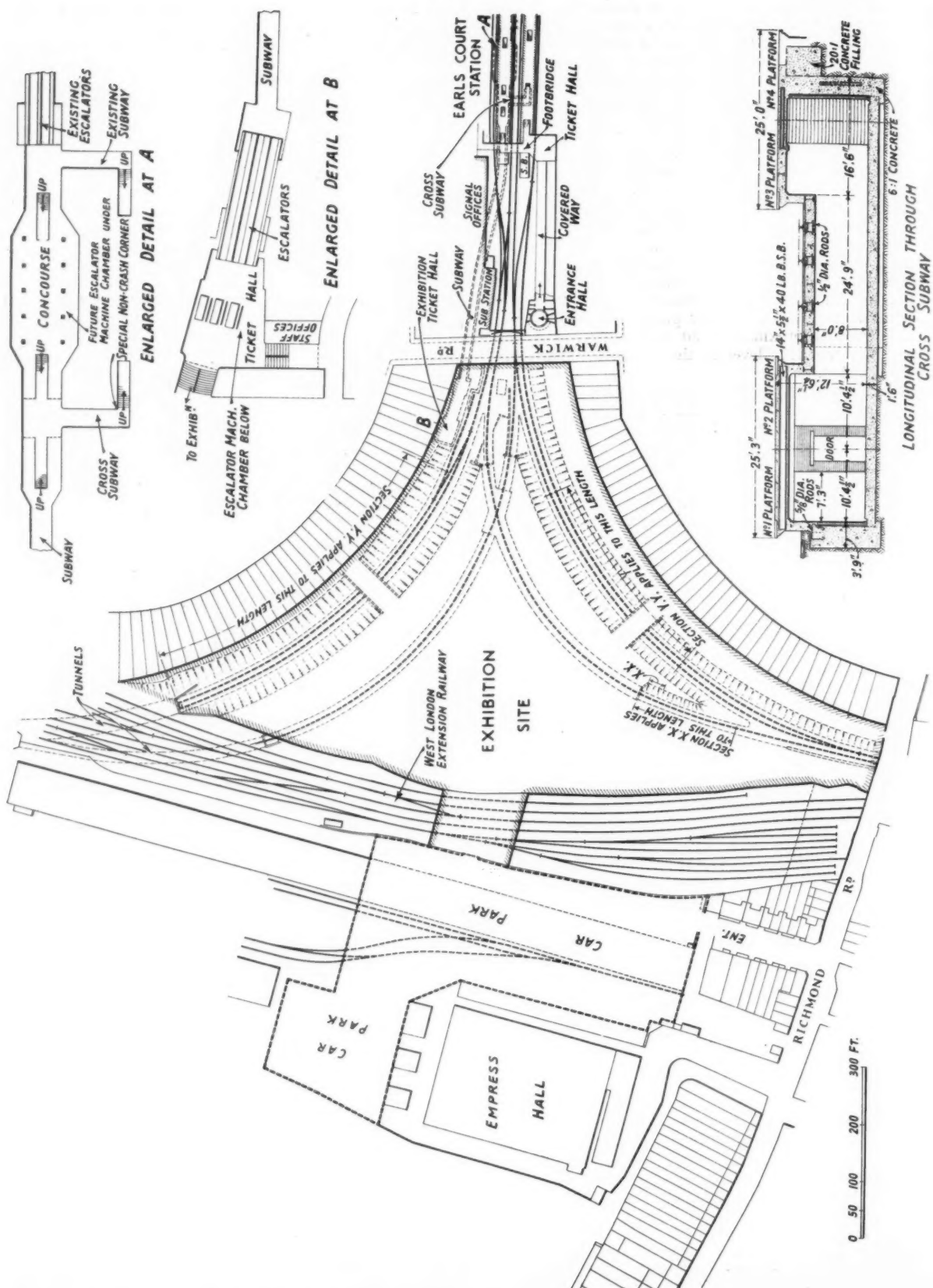


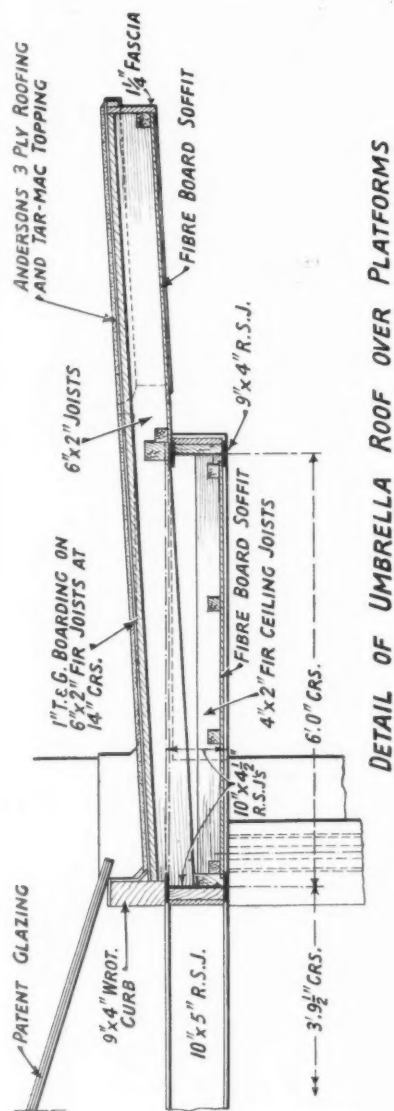
Non-crash corner enabling persons to avoid collision

of timber with patent glazing. The underside of the timber parts are covered by wall-board and the roof with vulcanite and tarmac finish.

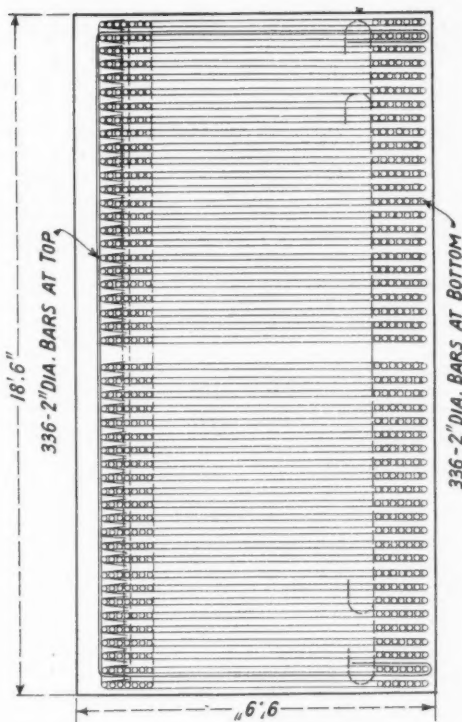
The escalator and subway connection between Earls Court station and the exhibition consists of a new subway beginning under platforms 1 and 2, at the head of the existing Piccadilly tube escalators, driven under the tracks and substation towards Warwick Road under which it passes and connects with an installation of two escalators (with provision for a third) which rise into the exhibition building. An additional subway and staircase have also been put in under the two middle District Line tracks to connect platforms 2 and 3 with the new subway works. At the foot of this new staircase, from platforms 2 and 3 to the cross subway, an interesting experiment has been made to provide against passengers colliding at the right angle turn into the subway. Here, at eye level, the corner of the wall has been recessed so that an earlier view is obtained by persons approaching the corner from opposite directions.

The escalators from beneath platforms 1 and 2 to the Piccadilly Line have been reconstructed, and the upper landing extended to form the commencement of the new exhibition subway, which, at this point, has been made

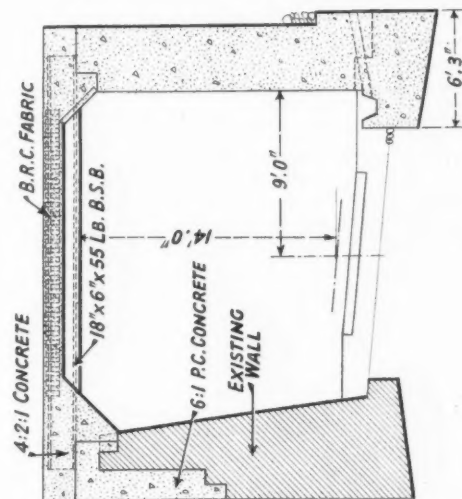




DETAIL OF UMBRELLA ROOF OVER PLATFORMS



DETAIL OF LARGEST PORTAL BEAM
SHOWING REINFORCEMENT

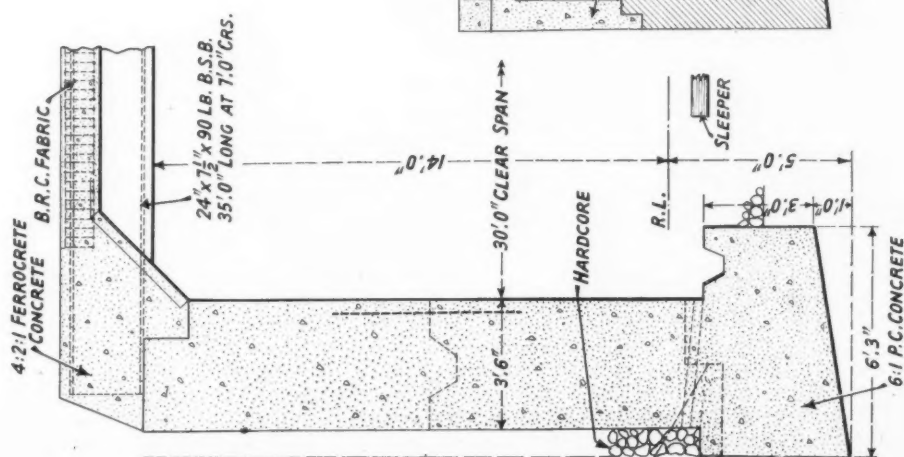


SECTION X.X.
(SEE PLAN)

Above : Layout plan and general arrangement details

Below : Construction details

LAYOUT AND DETAILS OF RAILWAY WORKS FOR EARLS COURT EXHIBITION



PART SECTION Y.Y.
(SEE PLAN)

of such a width that its boundaries extend laterally under the tracks on each side of the platform, providing a space between two rows of columns which support the platform walls for future escalators to be put in connecting with the Piccadilly Line. From this wide concourse the new subway slopes down below the District Line to a maximum depth of about 40 ft. below Warwick Road, beyond which an escalator takes the passenger to a basement ticket hall within the exhibition grounds whence staircases rise into the exhibition building.

The subway is in a 16-ft. cast-iron tunnel with a short length of cut and cover at the station end. False vertical walls have been built within the tunnel giving a uniform width of 12 ft. clear for pedestrians. A series of niches in these walls are fitted out as shallow showcases and will provide a source of lighting in addition to the normal ceiling lights. All the walls are faced with faience slabbing with coloured bands and the usual poster-group framings. The ceilings are finished in smooth plaster. The floors throughout are of L.P.T.B. standard 12 in. \times 12 in. concrete tiles. The ticket hall within the exhibition will serve exhibition traffic only and has no direct connection with the street. It contains a battery of three ticket booths with a system of barriers for crowd control. The usual station staff accommodation also is provided. Steel rolling fire shutters can close both entrances from the exhibition to isolate the railway property.

The concourse and subways serving the District Line function as a permanent interchange with the Piccadilly Line, but the subway, being for exhibition service only, can be cut off by gates and shutters when not required.

In order to carry out the subway construction without interference with traffic and in the short time stipulated, much ingenuity had to be displayed. Sir Robert MacAlpine & Sons (London) Ltd., the contractor, was faced with difficulty in the early stages of the work, which began on May 8, 1936, by the effect of complaints of noise from residents in the neighbourhood which necessitated the elimination of night work. As a consequence the Board and the contractor agreed to suspend operations between 11 p.m. and 7 a.m., and to confine work between 7 p.m. and 11 p.m. to that which gave rise to no exceptional noise. Only on four Saturday nights, which were not consecutive, was it found necessary to carry out special works. This agreement, which entailed the working of only two shifts, came into force on June 24, 1936, and was estimated to increase the contract time by 50 per cent. Much of the station work, of course, had to be carried out on Sundays when there is less traffic than on weekdays.

The escalator tunnel was driven downwards, from the booking hall in the exhibition grounds, partly in ballast and partly in clay. The soffit of the lower chamber of the escalator, 26 ft. in diameter, was only 2 ft. below the top of the clay. These tunnels were executed by first driving an 8 ft. circular iron pilot tunnel at axis level, and subsequently enlarging this pilot by changing two rings at a time to a second pilot tunnel of 16 ft. diameter, from which the final sizes of escalator tunnel and 26 ft. lower chamber were mined, one ring at a time.

Owing to the very thin cover of clay above the top of the iron tunnels and the presence of water-bearing gravel overlying the clay upon which the heavy substation buildings of the Board were founded, it was decided to consolidate the ballast by using the Joosten process, for which J. Mowlem & Co. Ltd. acted as sub-contractors. The essential principle of this process consists of injecting liquid sodium silicate under pressure into the ballast, followed by a solution of calcium chloride. These chemicals react to form a silica gel, and the free silicic acid generated in the process combines with the loose quartz particles in the ballast, binding the whole

into a solid permanent mass resembling sandstone or conglomerate. The reaction is practically instantaneous and is non-reversible, the resulting compound being insoluble. Pressures up to about 200 lb. per sq. in. are commonly used for injection, and the only precaution necessary is to ensure that there is a water seal between the two chemicals, otherwise the reaction will begin in the injection pipe and block it. The first use made by the L.P.T.B. of this process was in the construction of the subway between Monument and Bank stations.

As a considerable quantity of water was found to be entering the completed escalator tunnel the joints were caulked with blue lead and rust over the top half of the tunnel. The water was trapped from the caulked portion and carried in pipes to a sump in the lower chamber of the escalator. The reason for this arrangement was that, if an attempt were made to seal the tunnel completely, the water would eventually find entrance through the weakest spot in the caulking, whereas the permission of even a restricted flow of water into the tunnel below the sealing would prevent water finding a weak spot where disfiguration would be conspicuous.

The 16-ft. subway tunnel from the bottom of the escalator tunnel was driven from a 12-ft. diameter working shaft within the exhibition site and passed under an L.C.C. sewer and the Earls Court sub-station out into an open trench in front of the Signal Engineer's office. It was necessary to curve the subway tunnel to avoid the cable shaft leading from the Piccadilly tube up to the basement of the sub-station. Chemical consolidation was again used under the sewer and also under parts of the sub-station where the cover of clay over the tunnel was considered to be insufficient for safety. A good deal of caulking was necessary in the finished subway tunnel, and, where dampness appeared in places which had not been caulked, copper trays were fixed to lead the water into channels behind the false side walls.

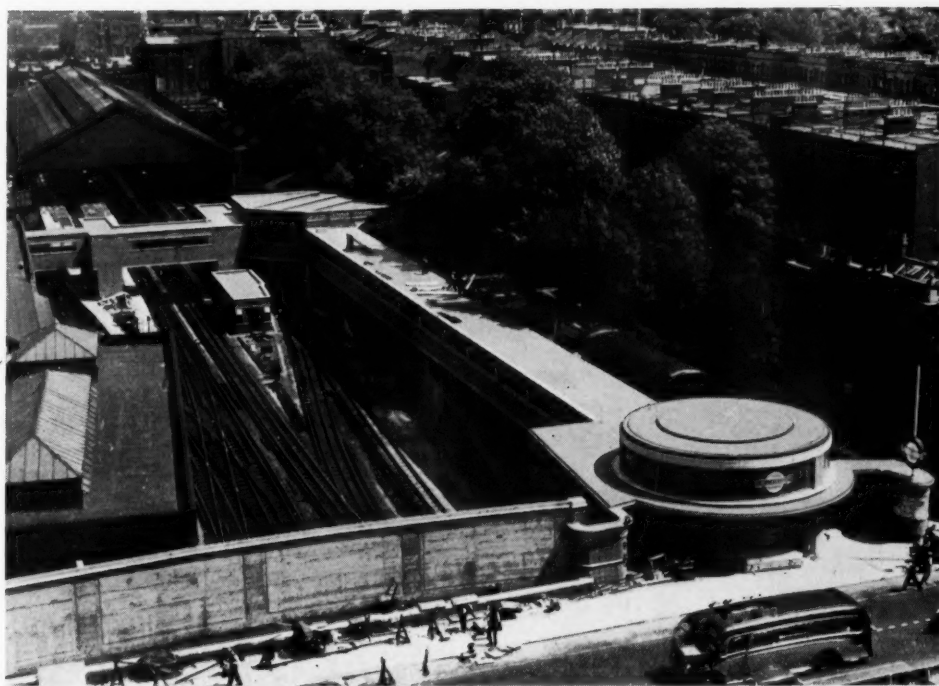
Where the subway comes under the station the work became more complicated. Tracks adjacent to the work were carried on longitudinal timbers and the platform was demolished and replaced by a temporary timber platform carried on transverse steel joists. A centre gallery was then driven the full length of the subway under the temporary platform and alternate pockets, about 7 ft. 6 in. wide, were driven out from the centre gallery to the outside face of the subway wall which was then built up. The intermediate bays were next excavated and the remainder of the wall concreted. The platform slab forming the roof of the subway was then built, and finally the subway floor was constructed. The site of the future machine chamber was 38 ft. wide and the same scheme of operation as that just outlined was adopted, except that here the sides of the subway extended under the running lines and involved the underpinning of the heavy retaining wall carrying the main station roof.

For the disposal of the spoil from the cut-and-cover section two hoppers were built over No. 1 eastbound track of the District Line, a small one of 40 cu. yd. capacity at the western end of the platform and a large one of 80 cu. yd. capacity further along the platform. The spoil was hoisted from the excavation to the hoppers by means of 30-cwt. petrol-driven cranes.

The work carried out by the L.P.T.B. was done under the direction of Mr. Arthur R. Cooper, Chief Engineer to the Board, the architectural work being designed by Mr. Stanley A. Heaps, the Board's Architect. The principal contractors to the Board were Sir Robert MacAlpine & Sons (London) Limited, and Hegeman Harris Inc. of New York and London were the contractors for Earls Court Limited. The reinforced concrete beams and columns were designed by L. G. Mouchel & Partners Limited.



Façade of exhibition from Earls Court station with new entrance gallery on left

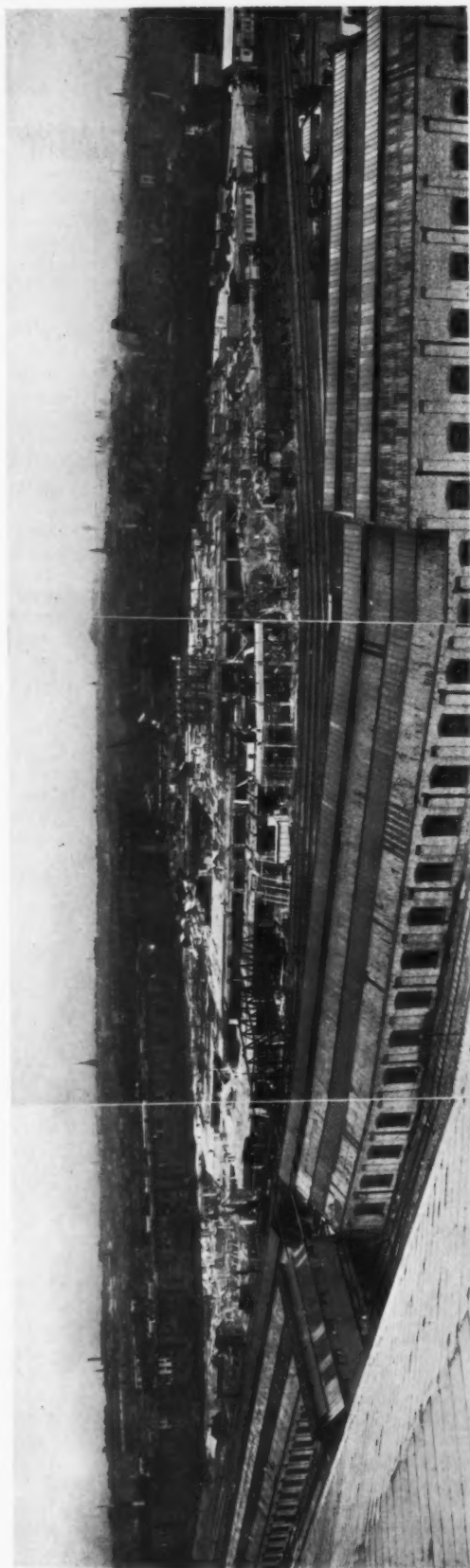


View showing new booking offices and gallery from Warwick Road and the new footbridge giving access to the platforms

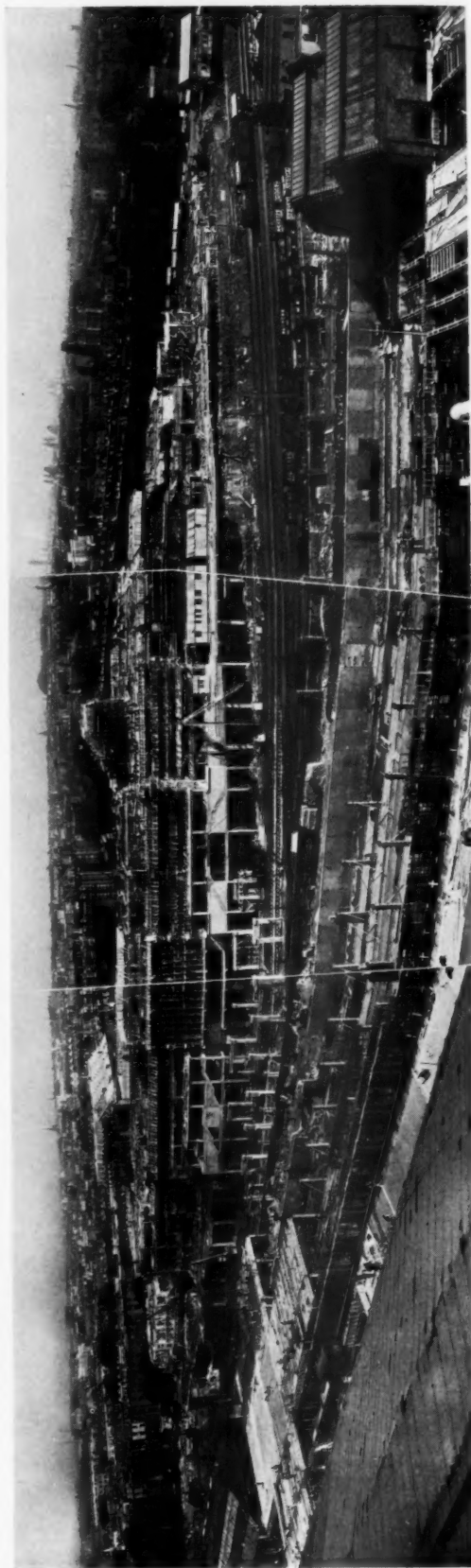
Photo]

[A. Merrill

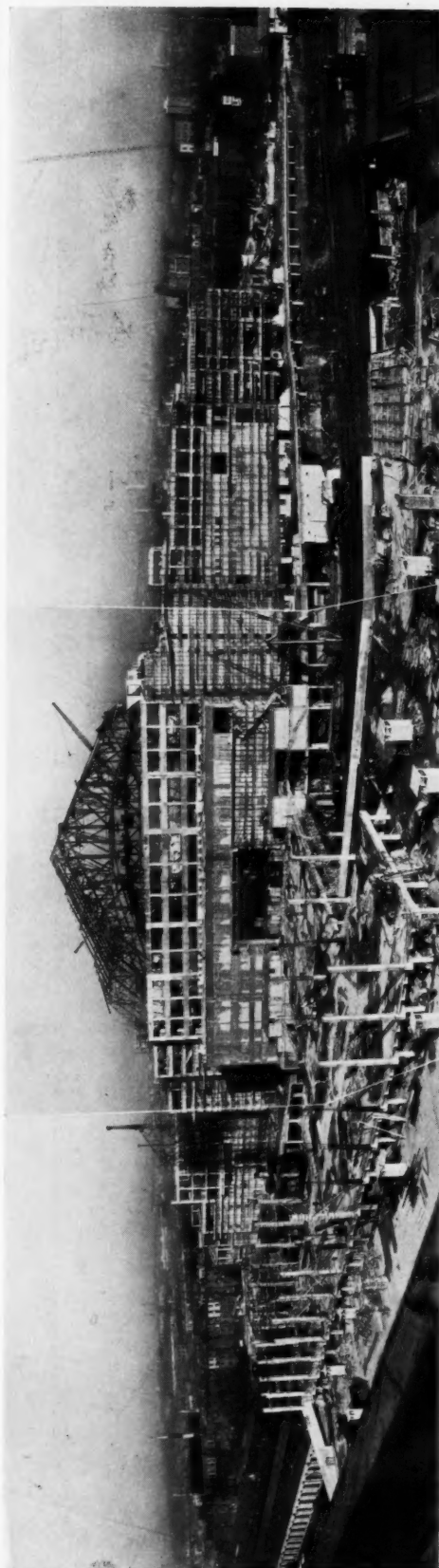
EARLS COURT EXHIBITION WORKS



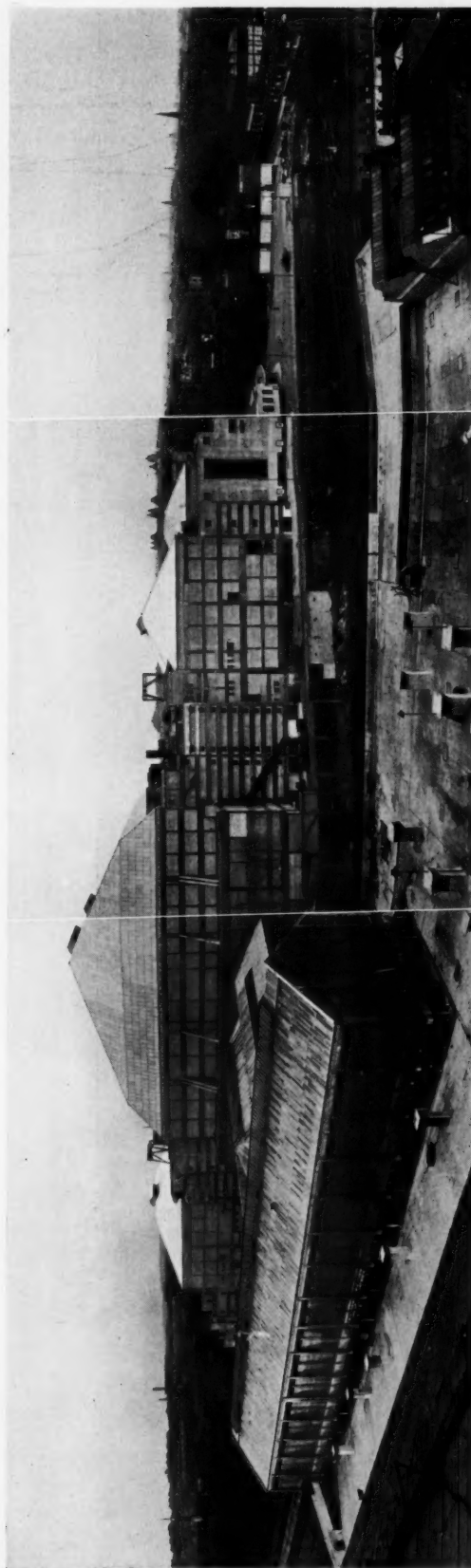
May 21, 1936 : Note demolition of footbridge across West London Extension Railway ; L.P.T.B. car shed in foreground



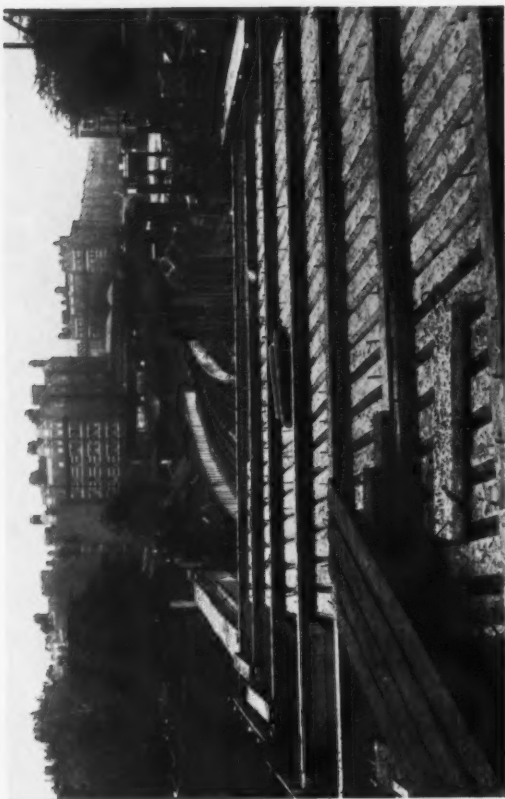
September 11, 1936 : Car shed removed and new bridge across W.L.E.R. under construction



January 7, 1937: Note new bridge over W.L.E.R. and roof trusses being erected on main hall



September 13: Main building complete; Richmond Road entrance on right (behind W.L.E.R.); car park in foreground
VIEWS TAKEN FROM THE EMPRESS HALL OF EARLS COURT EXHIBITION SHOWING PROGRESS OF THE WORK



Work on covered way in progress



Inside the new covered way
COVERING IN THE RAILWAYS ON THE EXHIBITION SITE



Work in early stage, showing original cutting



Completed covered way over cutting shown above



Ticket booths in gallery from Warwick Road



Circular ticket office at Warwick Road entrance



Subway to exhibition



New footbridge and platform roofs

NEW FACILITIES AT EARLS COURT STATION

THE USE OF ALUMINIUM IN RAILWAY COACHES

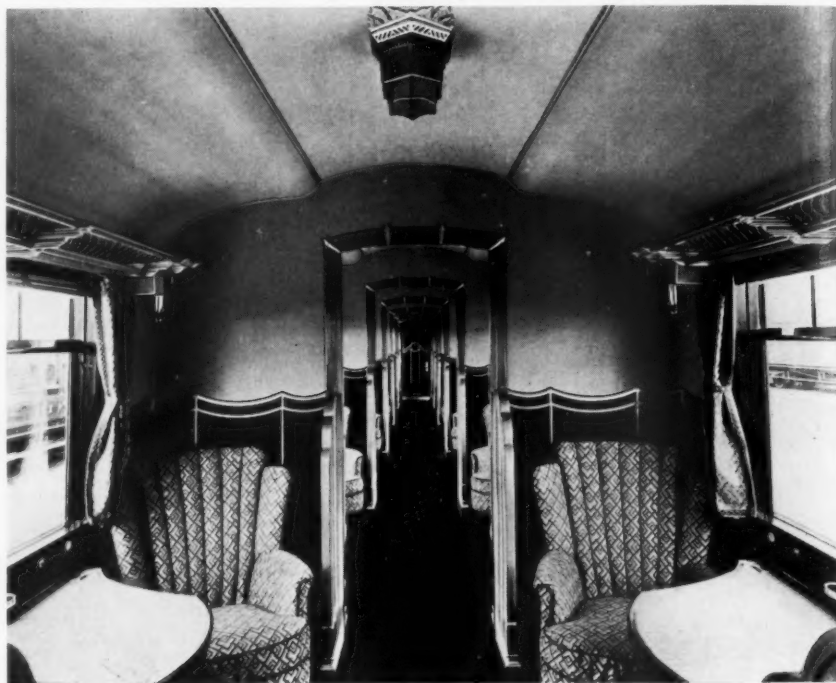
This material, partly in alloy form, is largely used in the Coronation trains of the L.N.E.R.

MUCH has been written in regard to the design and construction of the coaches of the L.N.E.R. Coronation expresses,* but a few particulars drawing attention to the use of aluminium alloys for internal fittings may prove of interest. The need of materials having good corrosion-resisting properties and applicable both to cast and wrought work was recognised, and in the former case a major point had to be kept in mind, namely, the very close tolerances and high finish required. All parts had to be supplied suitable for anodising, and finally aluminium alloy NA.305 was selected as the most suitable for the castings; and pure aluminium sheet and NA.55S alloy for the extrusions, all supplied by the Northern Aluminium Co. Ltd., of Banbury. The fact that further orders for train equipment have since been received bears sufficient testimony to the successful results obtained.

The castings supplied may be divided into the following categories; a right- and left-hand organ overlay, forming a fluted decorative attachment to the base of the seat screens; side screens, door and decorative fittings; luggage compartment and lamp-box layout. The screens, consisting of a heavy cast base and a wide bead or channel—the length of the latter is over 4 ft.—combined with curves and very thin sections, demanded extreme accuracy of alignment. These screens were used in conjunction with aluminium sheet and extrusions, and were required to fit an internal wooden panel. The door and decorative equipment consisted of small ornamental mitres, which were die cast. The combined roof lamp and ventilator was supplied to a design specially modified to permit rapid production. In this instance, a slight difficulty arose through a variation in the roof contour of the first and third class carriages. This was solved by taking advantage of the natural ductility of the aluminium and making a common pattern, the finished castings being bent to the required curvature.

* Described in THE RAILWAY GAZETTE of July 2 (page 31).

The suitability of aluminium for producing sections of decorative outline is exploited in the use of extruded mouldings for the luggage rack bars and net attachments. The curtain operating gear is also masked by an extruded section of intricate shape to give a pleasing appearance. It will be appreciated that as an anodised finish was required throughout, it was essential to select alloys which



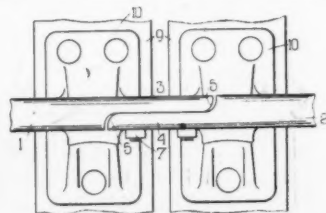
Interior of first-class carriage, showing aluminium fittings

would match well in tone when so treated. This was successfully accomplished by the choice of the alloys mentioned above, the compositions and heat treatment of which make them eminently suitable, while their mechanical properties are adequate to ensure robustness in construction and resistance to wear. The anodic finish was undertaken by Alumilite Limited, of Hammersmith.

Although aluminium is being increasingly called for in aircraft construction, modern architecture, and other fields of industry, this is the first instance in which aluminium fittings have been extensively used in this country for decorative work in high class railway coach equipment.

WELDED TRACK IN LONDON TUBES.—Flash butt welding plant has been installed at the Lillie Bridge permanent way depot of the London Passenger Transport Board and will be used to weld rails into continuous lengths of up to 300 ft. for laying in the deep level railways. On the Northern Line 19 track miles of these long rails are being laid between Kennington, Golders Green and Highgate. Between the long lengths Brogden joints will be used. This type of joint was

illustrated on page 953 of THE RAILWAY GAZETTE of December 4, 1936. The rail ends are scarfed and each is supported by both joint chairs, which are placed near together.



RAILWAY NEWS SECTION

PERSONAL

Mr. J. D. Cameron and Mr. Lawrence Jones, Managers respectively of the Los Angeles and Chicago offices of Associated British & Irish Railways Inc., are visiting this country and Ireland to prepare for a "Visit Britain" campaign in the U.S.A. The Los Angeles and Chicago offices of Associated British & Irish Railways are additions dating from early this year, and it will be recalled that Sir Josiah Stamp opened new premises for the concern in New York during his recent visit to the United States (see our issue of May 28).

Mr. J. B. Eastman's appointment as Interstate Commerce Commissioner in the United States for a new term of office expiring December 31, 1943, was confirmed by the Senate on July 26. The confirmation was of President Roosevelt's nomination.

MEMORIAL SERVICE TO LATE

MR. A. D. JONES

A memorial service was held at St. Nicholas Church, Guildford, on Wednesday, in memory of Mr. A. D. Jones, late Locomotive Running Superintendent, Southern Railway, who, as recorded in our issue of August 27, died on August 23, on board the ss. *Strathmore*, and was buried at sea. Among Southern Railway representatives present were:—

Messrs. R. E. L. Maunsell, Chief Mechanical Engineer; J. B. Elliot, Assistant Traffic Manager; H. E. O. Wheeler, Superintendent of Operation; A. Cobb, Locomotive Running Superintendent; J. Clayton, Personal Asst. to Chief Mechanical Engineer; E. S. Moore, Divisional Locomotive Superintendent; T. E. Chrimes, Asst. Eastern Divisional Locomotive Superintendent; A. J. Hollins, Asst. for Staff, Locomotive Running Department; also Mr. O. V. Bulleid, representing Sir Nigel Gresley, Chief Mechanical Engineer, London & North Eastern Railway; and Mr. R. Duckworth, late Chief of Police, Southern Railway.

The Secretary of State for the Colonies has recently approved the following appointment:—

Mr. A. Johnston, Assistant Engineer, to be Senior Assistant Engineer, Kenya & Uganda Railways and Harbours.

Mr. Robert Hunter has been promoted District Goods and Passenger Manager for the new L.M.S.R. Motherwell District as from September 20, with office at Motherwell.

Major M. P. Sells, O.B.E., M.I.Mech.E., M.I.Loco.E., M.Inst.T., who has been Chief Mechanical Engineer of the Nigerian Government Railway since 1926, has been appointed Chief Mechanical Engineer of the Rhodesia Railways. He was articled to the North British Locomotive Company,

the O.B.E. in 1919, and commissioned in the Regular Army Reserve of Officers, Royal Engineers. In the same year he was appointed District Locomotive Superintendent of the Tanganyika Railways, and in 1922 Chief Mechanical Engineer of the Gold Coast Government Railway. In 1926

Major Sells was appointed Chief Mechanical Engineer of the Nigerian Railway and acted as General Manager in 1934, as Assistant General Manager in 1935, and again as General Manager in the current year in the absence of Mr. J. H. McEwen on leave. During his service on the Gold Coast Government Railway, Major Sells reorganised the running section and was also responsible for the replanning of the locomotive works, and the planning and equipment of the new carriage and wagon repair shop. During his service on the Nigerian Railway, he introduced the "schedule" system of locomotive repairs at the Ebute Metta workshops and the replanning and extensions of these works, and also the extension of the carriage and wagon workshops in 1929-30. He was also responsible for the reorganisation of the running section in 1934. Major Sells is the author of the book "How the Locomotive Works and Why," and in 1935 contributed a series of articles to THE RAILWAY GAZETTE on "The Reorganisation of the Locomotive, Carriage and Wagon Workshops of the Nigerian Railway."



Major M. P. Sells, O.B.E., M.I.Mech.E., M.I.Loco.E., M.Inst.T.

Appointed Chief Mechanical Engineer, Rhodesia Railways

Glasgow, and between 1907 and 1912 gained experience in all the works departments and in the drawing office of that firm. Subsequently he had running shed experience on the London & South Western, and Lancashire and Yorkshire Railways, and in 1913 was appointed Assistant District Locomotive Superintendent, Wakefield, L. & Y.R.; and in 1915, Junior Assistant to the Chief Outdoor Locomotive Superintendent. In the following year he was commissioned as 2nd Lieutenant in the Corps of Royal Engineers, and in 1917 appointed Superintendent of Light Railways (Mechanical and Operating) with the rank of Major, R.E. He was twice mentioned in despatches and awarded

It is with regret that we record the sudden death from heart trouble on September 14 of Mr. H. Chambers, Locomotive and Personal Assistant to the Chief Mechanical Engineer, Euston, L.M.S.R. Mr. Chambers began his locomotive career at the Derby works of the former Midland Railway, passing through the principal shops and serving a period as a pupil fireman; later, he was transferred to the locomotive drawing office. Subsequently, Mr. Chambers obtained the post of Senior Locomotive Draughtsman with Beyer, Peacock & Co. Ltd., Manchester, but returned to the Midland locomotive drawing office at Derby in 1913. After the formation of the L.M.S.R. group in 1923, Mr. Chambers became Chief Locomotive Draughtsman of the Midland Division, and in 1927 was promoted to be Technical Assistant and Chief

Locomotive Draughtsman, L.M.S.R. In that position he served under three Chief Mechanical Engineers, namely, Sir Henry Fowler, Mr. E. J. H. Lemon, and Mr. W. A. Stanier. In 1934 he also took over the Carriage and Wagon Section drawing office at Derby. Mr. Chambers was concerned with the production of drawings for the new L.M.S.R. standard locomotive



The late Mr. H. Chambers

Locomotive and Personal Assistant to the Chief Mechanical Engineer, L.M.S.R., 1935-37

classes, notably the "Royal Scots" and "Princess Royal" Pacifics. In 1935 he was appointed Locomotive and Personal Assistant to the Chief Mechanical Engineer, and transferred to Euston. Mr. Chambers was a Member of the Institution of Mechanical Engineers, and the Institution of Locomotive Engineers. The funeral takes place at Golders Green Crematorium at 2.30 p.m. today.

LUNCHEON TO FORMER HUDDERSFIELD OMNIBUS COMMITTEE CHAIRMAN

A luncheon was given by the L.M.S.R. at the Euston Hotel on September 13 to Alderman Thomas Canby, who recently retired from the Huddersfield Council, on which for five years he was Chairman of the Huddersfield Corporation and L.M.S.R. Joint Omnibus Committee. A presentation on behalf of the committee of an inscribed rose bowl was made to him by Mr. Ashton Davies, Chief Commercial Manager, L.M.S.R., who presided. Mr. H. G. N. Read, Road and Air Assistant to the Chief Commercial Manager, has succeeded Alderman Canby as Chairman of the joint omnibus committee. Other L.M.S.R. representatives at the luncheon were:—

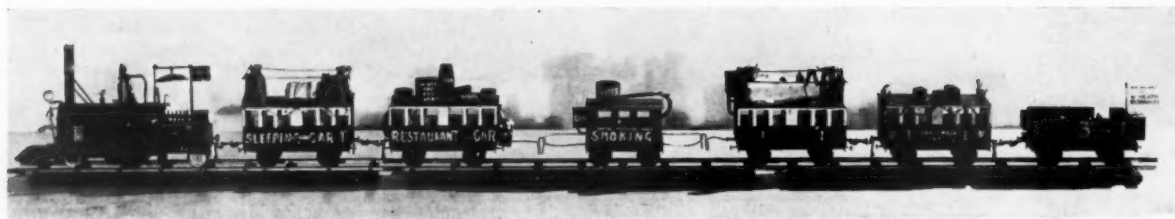
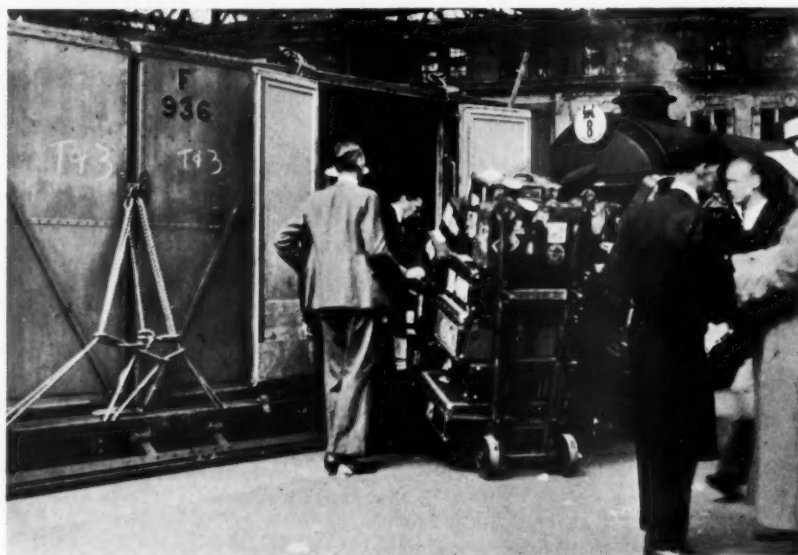
Mr. Ernest Taylor (Chief Accountant), Mr. G. Morton (Assistant Accountant), Mr. T. G. Jarman (Chief Accountant's Office), Mr. H. A. Hooks (District Passenger Manager, Leeds), Mr. W. E. Yates (Assistant Road Motor Engineer, Euston).

L.M.S.R. GOLF CHAMPIONSHIP DRIVER WINS ROWLANDSON CUP

The final of the L.M.S.R. Golf Championship, for the L. F. Rowlandson Cup (a trophy presented by Mr. L. F. Rowlandson, Superintendent of Organisation and Staff, L.M.S.R.), took place at the Hillside course, Southport, on Saturday last (September 11), when the winner was Mr. C. Carter (handicap 14), an engine driver at Normanton, Yorks. Mr. Carter's winning score was 141 (net) for the 36 holes, which were contested on medal play. Runner-up was Mr. B. Smith (handicap 6), a clerk in the Accountant's Office at Belfast (York Road), with 148 net, while third place was filled by Mr. G. Ingram (handicap 18), a junior clerk in the Traffic Department, at Bispham, with a net score of 153. Altogether 23 competitors, survivors of an original record entry of 355 from all parts of the L.M.S.R. system, participated in the final, which took place in ideal weather. At the end of the day's play the Rowlandson Cup and other awards were presented by Mrs. L. F. Rowlandson; the prize giving was presided over by Mr. L. F. Rowlandson. Among those who attended were:— Messrs. G. S. Bellamy, A. L. Castleman, J. Dickson, E. G. Garstang, C. Jones, J. M. Kirkwood, C. N. Mansfield, J. E. Papworth, H. E. Roberts, R. D. Roberts, S. Roberts, H. Rudgard and J. B. Scattergood.

Right: Loading a luggage container on French Line special at Waterloo (see foot of opposite page)

Below: Mr. R. M. Spofforth's "Heath Robinson" model train, which he is exhibiting at the Model Engineer Exhibition, opened yesterday by Sir Nigel Gresley (see page 490)



Census of Railway Employees

As noted in our editorial columns, a return has been issued showing (1) the number of staff employed by the railway companies of Great Britain, the Railway Clearing House, and on the railway undertakings of the London Passenger Transport Board during the week ended March 13, 1937, and (ii) a comparison of the rates of pay and average weekly salary or wage of, and average weekly payments to, certain selected grades during the weeks ended March 13, 1937, and March 7, 1936.

Details are given of the number employed in each of the principal grades by the four amalgamated companies, certain committees, London Transport, and the Clearing House, with totals for each undertaking and for Great Britain. Male and female employees are shown separately, and, with the exception of staff not employed directly, *e.g.*, staff employed by contractors, all persons in the service of the railway undertakings mentioned during the week of the census are taken into account. The figures represent the numbers of staff receiving salaries or wages for the full week combined with the equivalent number of full-time workers in cases where employees were paid for less than the complete week.

The average payments to certain of the adult male staff were shown by the returns received to be as follows:—

	Week ended—	
	March 13, 1937	March 7, 1936
Staff entered at salaried rates:—	1937	1936
	s. d.	s. d.
Clerical, supervisory, &c., staff (exclusive of officers and of staff entered under ancillary businesses) ...	93 0	92 0
Staff entered at wages rates (excluding staff entered under ancillary businesses):—		
Conciliation staff ...	66 1	64 5
Shop and artisan staff ...	70 10	69 1

The average payments represent salaries or wages, residual bonus (if any), war wage, piecework payments, tonnage bonus, payments for overtime, Sunday duty, night duty, commuted allowance and any other payments for work performed, but exclude compensation allowance, travelling and out-of-pocket expenses, and meal and

lodging allowances. The deductions operating by agreement as from March 28, 1931, were partially restored as from the first full pay following October 1, 1934, and further partial restorations were made in Jan., 1935, and Aug., 1936.

Summary of Total Staff Employed

Name of Company	At March 13, 1937	At March 7, 1936
G.W.R. ...	100,614	98,290
L.N.E.R. ...	175,849	171,798
L.M.S.R. ...	230,323	222,869
Southern ...	67,735	66,399
Cheshire Lines ...	2,791	4,022
London Transport ...	15,088	14,283
M. & G.N. Joint ...	1,358	2,026
Railway Clearing House ...	1,862	1,854
Other companies ...	4,032	4,090

It should be noted that certain of the staff of the Cheshire Lines have been transferred to the L.M.S.R. and that certain of the M. & G.N. Joint Staff have been transferred to the L.N.E.R. in 1937.

The following table gives the numbers employed in each of the principal grades and in ancillary businesses during the selected week in 1937, with the corresponding numbers for the selected week in 1936:—

Male Staff	1937	1936
Railway Staff:—		
Capstanmen ...	1,163	1,187
Carters and vanguards ...	24,259	22,946
Carriage cleaners ...	6,504	6,372
Carriage and wagon examiners ...	4,240	4,240
Carriage and wagon oilers and greasers ...	1,838	1,805
Checkers ...	8,840	8,792
Cranemen ...	528	512
Crossing-keepers ...	1,340	1,322
Engine cleaners ...	6,353	6,742
Engine drivers and motormen ...	36,202	34,629
Firemen and assistant motormen ...	32,842	31,688
Foremen and charge-men ...	7,127	6,965
Guards—goods ...	14,364	13,883
Guards—passenger ...	7,546	7,517
Hydraulic and pumping engine staff ...	791	819
Labourers ...	26,257	25,185
Lampmen ...	1,741	1,806
Loaders, callers off, ropers and sheeters ...	5,748	5,566
Locomotive shed staff (excluding labourers) ...	8,834	8,806
Messengers ...	974	924
Number-takers ...	1,938	1,941
Officers and clerical staff ...	63,010	62,823
Permanent-way men ...	57,055	55,129
Pointsmen ...	292	271

Male Staff (contd.):— 1937 1936

Police staff:—		
Supervisory grades ...	150	149
Other grades ...	2,158	2,150
Porters:—		
Goods ...	14,318	13,734
Passenger ...	24,526	23,982
Porter guards ...	546	541
Porter signalmen ...	2,120	2,126
Shop and Artisan Staff:—		
Supervisory grades ...	2,742	2,595
Other grades (excluding labourers and watchmen) ...	96,790	95,647
Shunters ...	16,983	16,825
Shunt-horse drivers ...	269	286
Signal and telegraph men ...	5,932	5,806
Signalmen ...	24,354	24,459
Signal box lads ...	1,579	1,504
Stationmasters, yardmasters, &c. ...	5,277	5,213
Supervisory staff (other than shop and artisan and police) ...	9,552	9,503
Technical staff ...	3,543	3,208
Ticket collectors ...	3,611	3,649
Traffic control staff ...	1,476	1,437
Watchmen ...	403	393
Miscellaneous grades ...	10,147	10,023

Railway total ...	546,262	534,600
Ancillary Businesses:—		
Canal staff ...	1,186	1,152
Dock and quay (other than shop and artisan) staff ...	12,119	11,551
Marine (other than shop and artisan) staff ...	3,952	3,770
Marine and dock shop and artisan staff ...	3,515	3,404
Omnibus and passenger road vehicles:—		
Conciliation staff—traffic department ...	23	30
Hotel, refreshment room, dining car and laundry staff ...	7,982	7,636

Total—Ancillary businesses ...	28,777	27,543
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Total — Male staff ...	575,039	562,143
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Female Staff 1937 1936

Railway:—		
Carriage cleaners ...	621	599
Clerical and technical staff ...	11,706	10,830
Crossing-keepers ...	1,530	1,509
Office cleaners and charwomen ...	2,821	2,747
Shop and artisan staff ...	1,100	1,116
Waiting room and lavatory attendants ...	538	543
Miscellaneous grades ...	422	453

Total ...	18,738	17,797
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Ancillary Businesses:—		
Hotel, refreshment room, dining car and laundry staff ...	5,681	5,492
Marine staff ...	194	179

Total—Female staff ...	24,613	23,468
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GRAND TOTAL—ALL STAFF ...	599,652	585,611
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Luggage Containers on Southampton Boat Trains

(See illustration on opposite page)

The use of containers for both light and heavy luggage on the French Line boat specials from Waterloo to Southampton Docks is an innovation which, as it has resulted in considerable economy in the time required for transshipping passengers' luggage, as well as proving a convenience to the passengers themselves, has now become a permanent feature. Instead of the heavy luggage being loaded into ordinary vans, and the trains being encumbered by quantities of hand

baggage, all heavy baggage is now placed in containers of the road-rail type attached to the front of the train, and all hand baggage (except small or fragile pieces carried by the passengers themselves) goes into containers attached to the rear. On arrival of the boat specials at Southampton Docks, the baggage containers are at once shunted to the quay-side, where they are lifted intact into the ship. By this means the baggage has the minimum of handling, and the time required for

loading from the quay is almost halved. Further, loss and damage is minimised, and the passengers have the satisfaction of seeing their possessions loaded at Waterloo and can rest assured that they will reach the ship without fail. As many as 14 of these containers have been used in connection with one sailing. Another feature of the special Southampton boat trains is the increasing tendency recently to use Pullman cars instead of ordinary coaches for first or cabin-class passengers. During the twelve months ended June 30 last 424 Pullman cars were used on French Line boat specials.

MINISTRY OF TRANSPORT ACCIDENT REPORT

Langrick, L.N.E.R.: March 8, 1937

At about 1.24 p.m. the 12.44 p.m. up express, Lincoln to Boston, composed of one quadruple articulated non-corridor set, one 6-wheeled brake van and one 6-wheeled saloon, drawn by 2-6-0 engine No. 126, was derailed when approaching Langrick station at high speed. The engine alone remained on the rails, its passage widening the gauge for approximately one rail length on the outside of a left-handed 40-ch. curve, causing the tender to be deflected to the left and derailed inside it; destruction of track derailed the following vehicles. Couplings held and the train came to rest practically upright and in line 333 yd. from the point of derailment; there was no telescoping. In the last 50 yd. the coaches scraped a shunted coal train on the down main, tearing away sides of compartments and causing other superficial damage. The up line was practically destroyed for 330 yd., and chairs in the down line broken. The weather was fine, but there had been much rain for a few weeks.

Major G. R. S. Wilson conducted the inquiry. The accompanying diagram gives the leading features of the accident and particulars of the line. From Lincoln to Boston gradients are inappreciable, though there is a fair amount of curvature. Approaching Langrick from the north-west the line is on a moderately high bank. The super-elevation given to the 40-ch. curve was $1\frac{1}{2}$ in., corresponding to the company's present standard for 35 m.p.h.; for 60 m.p.h. $2\frac{1}{2}$ to 3 in. is now considered desirable. The permanent way was new in 1895, with 85-lb., 30-ft. rails, now weighing 77 lb. per yd., and old G.N.R. 46-lb. chairs, fastened by 2 spikes and 2 trenails. There were 11 sleepers per rail length of creosoted fir, 8 ft. 6 in. and 9 ft. \times 10 in. \times 5 in. Ballast was slag for 4 in. under sleepers, with gravel boxing to tops, somewhat dirty. No signs of wet formation were seen. Traffic consists of 7 passenger trains—2 non-stop at Langrick—and 6 goods trains each way daily. The $10\frac{1}{2}$ miles from Woodhall Junction to Langrick are maintained by a ganger, 3 sub-gangers—2 acting as patrolmen—and 9 lengthmen, with motor trolley, under a branch manpower formula of 0.8 (1.0 is the main line maximum).

Line and level in rear of the derailment appeared good; the $1\frac{1}{2}$ -in. cant round the curve was fairly regular. Gauge was nowhere tight; the greatest slackness noted was $\frac{1}{4}$ in., with $\frac{1}{8}$ in. variation in one rail at several points (see plan for other details). From the twelfth rail of the curve chairs were displaced, with gauge widened seriously on the outside, the maximum being $1\frac{1}{2}$ in. This was caused by the train concerned in the accident, but the slackness in rear appeared of much longer standing, due to numerous unsatisfactory track fastenings. Spot re-

sleeping had been carried out, but not very recently; 50 per cent. of the original sleepers remained, in which softness and decay in chair-seats were seen, as also in some renewed sleepers. Many old sleepers were chair-galled $\frac{3}{4}$ in. Many spikes had been working and were proud of the chairs; odd ones could be pulled out. Some refastening had been done, with sleepers or chairs shifted and fresh spike holes bored. Some coach screws had been used for this, but spikes and trenails predominated. Where the gauge was seriously widened there were 8 old sleepers together. Decay round their spike holes was pronounced; the trenails were also decayed, and some sheared.

Mr. J. I. Campbell, District Engineer—who took charge only 3 weeks before the accident—said it was proposed to re-sleeper this section in 1932; records at headquarters confirmed this, but noted that the length could stand for another year; there is no record that the proposal was subsequently re-submitted. Engine No. 126, K3, mixed traffic class, was built in 1925 and is a heavy and powerful machine (see plan); the intermediate coupled wheels have thin flanges. This class has been working regularly between Lincoln and Boston since 1932. No. 126 was last under general repair in May, 1936. Tyres and flanges were not unduly worn, having regard to the mileage run since, 28,698 miles; wheel loadings showed no important variation from design; tender axleboxes were considerably worn, but the wear was not considered excessive for the mileage. It was $\frac{3}{16}$ in. on the trailing boxes, and Major Wilson thinks such conditions may conduce to undesirable lateral oscillation at speed, causing undue stress on track fastenings.

The train was booked from Woodhall Junction to Boston at an average of 42.3 m.p.h.; it left the former place on time. Calculations from time bookings at Langrick show that average speed from Dogdyke, $5\frac{1}{2}$ miles north, was $57\frac{1}{2}$ m.p.h., appreciably faster than usual. Signalman Bishop said the speed appeared higher than usual as the train approached him. Mr. H. C. Orchard, District Engineer's draughtsman, who was in the train, experienced uncomfortable riding for the first time with it, and thought it was travelling unusually fast. Chief P.W. Inspector J. S. Greensmith confirmed this. Driver F. Wilson, well acquainted with road and train, thought he approached Langrick curve at 45 to 50 m.p.h.; that was normal for the class of train. As usual he shut off steam at Langrick distant and had no apprehension regarding the curve. The journey was normal until the tender oscillated, with the derailment; before that there was no unusual movement. He had neither experienced nor heard of rough

running on this curve and made an emergency brake application on seeing the whole train was derailed. Fireman F. L. Lewis' evidence was similar. Another driver, W. Ward, said there was no need to go fast round this curve to arrive punctually at Boston.

Major Wilson thinks it probable the speed was 60 m.p.h., but there is no speed restriction here and the driver can hardly be criticised. Patrolman C. Clay walked from Dogdyke to Langrick that day. He noted no misalignment or defect in the up line, nor did he on the previous Saturday. He had reported a misalignment of not over $\frac{1}{2}$ in. about a month before, but said the up road did not frequently get out of line. He had not noted any serious oscillation when watching the 12.44 p.m. train pass, nor experienced any particular trouble with regard to gauge. He had not noticed any soft, decayed sleepers, nor reported any new ones being required for 3 or 4 years. He did not think many had been renewed in that time.

S. Gray, in charge of the gang, said they were employed from February 14 to 17 on ordinary fettling work. He had no reason then to give special attention to gauge and fastenings. He found no slackness worse than $\frac{1}{4}$ in. slack a fortnight before the accident; if more than $\frac{1}{4}$ in. it would require attention. Despite the working of the spikes he was satisfied with the condition of the sleepers and had not removed chairs to examine them. He had put in about 12 new sleepers on the curve during the last twelve months.

Permanent Way Inspector J. S. Fravigar inspected the length on February 24. He had no gauge with him but could generally tell by eye if gauge were becoming irregular. He noticed nothing sufficient to report to the ganger, neither did he consider special attention to the fastenings required. There would have been no difficulty in obtaining new sleepers. Some bad ones 12 months ago had been replaced. Travelling over the section monthly on the footplate, he had been satisfied with the riding. He was unable to say whether any particular class of engine was severe on the permanent way, and had no complaints that it was suffering from heavy ones.

Mr. J. S. Greensmith, Chief P.W. Inspector, Boston District, said he did not make regular inspections of the permanent way, but if an inspector reported a section as requiring special attention he would examine it, and ensure the supply of materials. That might occur once or twice a year. If he had no sleepers he could certainly get them from the District Engineer. He was emphatically not satisfied with the up line at Langrick, and Fravigar should have brought it to his notice. The company informed Major Wilson that Mr. Greensmith's duties were mostly concerned with supervising the relaying gangs; it was im-

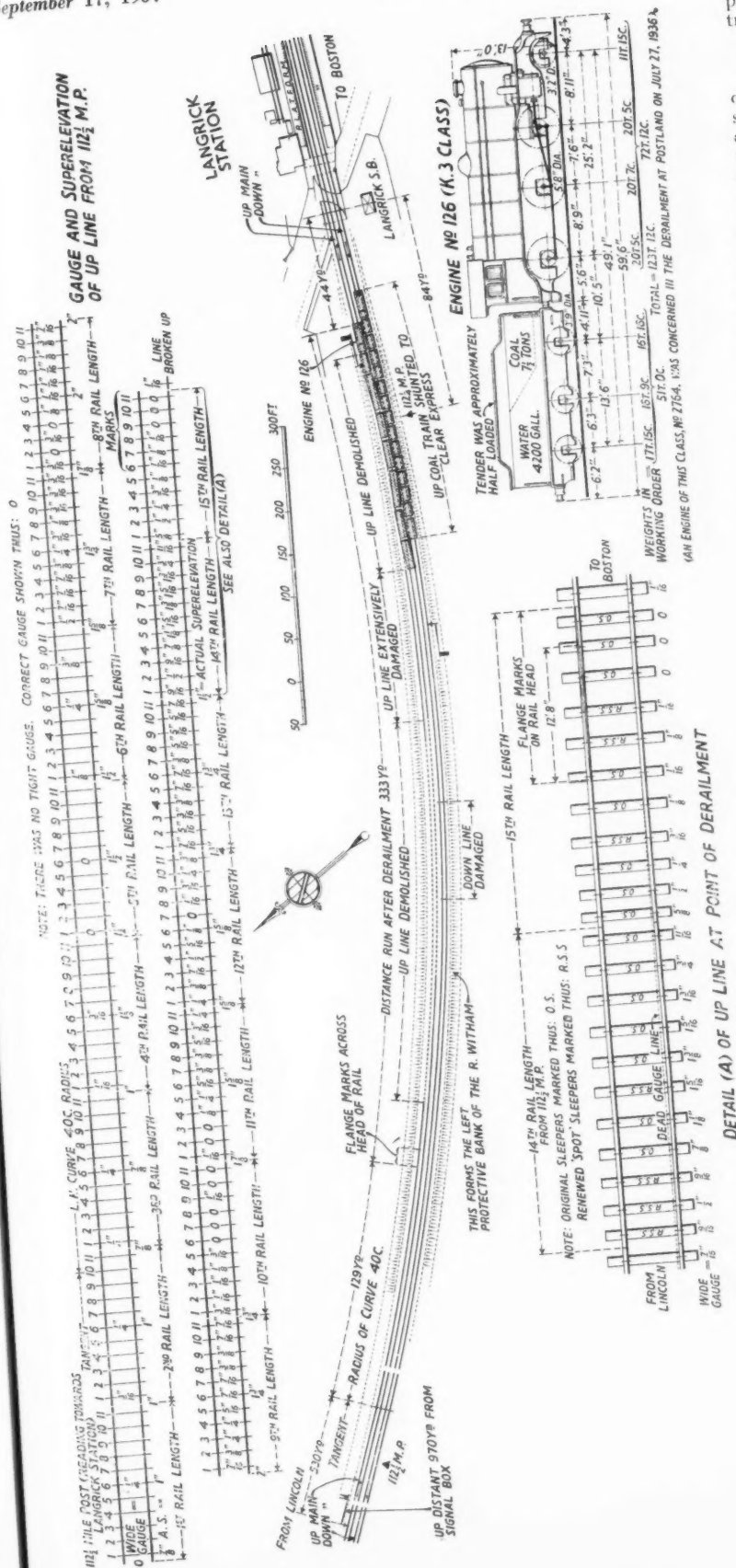
September 17, 1937

practicable for him to make routine track inspections.

Inspecting Officer's Conclusions

Failure in lateral strength of a road, overdue for renewal and insufficiently strengthened by spot re-sleeping, caused this accident. Superelevation was deficient and probably the passage of the heavy engine at 60 m.p.h. on the 40-ch. curve widened the gauge where the holding power of the outer rail fastenings was seriously diminished. Fastenings beyond, on newer sleepers, held, and distortion of the rail probably caused the tender to be violently deflected, favouring the mounting of the inner rail by its left leading wheel; relieved of weight by centrifugal action, and possibly surging of the water in the half-empty tank. Had the engine not kept the rails more serious consequences would certainly have followed. Although K3 class engines have been running here for some years without trouble, sleeper decay was becoming progressively more serious; it required only a rather higher speed than usual to bring about complete failure. In 1931 this section of line was recognised as nearing the end of useful life; it was submitted for inclusion in the 1932 relaying programme, but struck out for reasons described. When, however, renewals are deferred by headquarters, it is expected that the proposal should be kept forward by re-submission yearly and that, in the meantime, the permanent way staff should take such action as may be necessary to strengthen a road by the spot replacement of sleepers, or to impose a special speed restriction, having due regard to the type and weight of engines running, pending complete renewal. Unfortunately, the matter was not pursued in this instance, and, indeed, was overlooked locally, nor apparently was any special action taken to strengthen. In these circumstances, if track reported as due for renewal is not promptly dealt with, or if recommendations once made are not pursued annually until given adequate priority in the relaying programme, the District Engineer and staff are given unnecessary responsibilities.

There was undoubtedly serious misjudgment of the remaining strength of this road, having regard to the high speed regularly attained by heavy engines; for this Permanent Way Inspector J. S. Fravigar is also not free from responsibility. Although his task was rendered more difficult by undue deferment of complete renewal, he failed to appreciate that a large proportion of the sleepers were seriously decayed; indeed, he appeared to be unduly complacent as to the fitness of this track to carry the prevailing traffic and had not contemplated putting it forward for renewal until 1938. Although he was unaware of the earlier proposal, the usual signs of weak fastenings and chair movement were not lacking; some of this movement appeared to be of long standing, and extensive replacement of sleepers, in the



supply of which there was stated to be no difficulty, had clearly been required for some time.

Similar criticism applies to Ganger S. Gray. He had maintained his length with care in respect of line and level, but not paid equivalent attention to the fastenings. It is difficult to accept his statement that on February 24 he found no slackness greater than $\frac{1}{4}$ in. In addition to loose and working spikes, a considerable proportion of the trenails were decayed and required replacement; the clear signs of decay under the chair seats had made little impression on him or on his patrolman, F. Clay. In view, however, of their position, their responsibility is proportionately less.

Remarks and Recommendations

The company at once prohibited the running of K3 class engines between

Lincoln and Boston pending full consideration of the condition of the track; the original proposal for resleepering has been put into effect. Instructions have also been given to examine the question of the operation of these engines on other secondary lines where material is becoming old, with a view either to prohibiting them or limiting their speed.

This case illustrates the necessity of giving consideration to the condition of secondary lines generally in relation to the increasing speed and weight of traffic. The company's policy is to modernise locomotive stock by the construction of heavy engines of general utility type, large tractive power being combined with capacity for high speed. Strengthening of the permanent way on secondary lines appears necessary too, otherwise the use of such engines has to be limited, or their speed restricted,

to ensure the safety margin not being unduly lessened. The merits of spot replacement of sleepers, as a normal method of maintenance, appear questionable. This practice should be limited as far as possible to the replacement of sleepers which for any reason have shown a sub-normal life. Spot replacements begun on a comprehensive scale are apt to go on indefinitely, and it becomes more difficult to judge the true condition of a section of line, whether in the course of day-to-day maintenance or when the track comes under consideration for complete renewal.

The deficiency of superelevation must have added appreciably to the pressure on the outer rail fastenings, and, having regard to increasing speed, it should now be increased to conform with the latest standards. It appears desirable to consider this point generally.

Sir Nigel Gresley opens "Model Engineer" Exhibition

The nineteenth annual "Model Engineer" Exhibition was opened yesterday (Thursday) at the Royal Horticultural Hall, Vincent Square, S.W.1, by Sir Nigel Gresley, C.B.E., Chief Mechanical Engineer, L.N.E.R. He was supported by Mr. Percival Marshall, Editor, *The Model Engineer*, and among those present was Mr. W. A. Stanier, Chief Mechanical Engineer, L.M.S.R. The exhibition remains open daily between 11 a.m. and 9.30 p.m. until September 25.

Sir Nigel Gresley, in his opening address, emphasised the importance of model building to the engineer, as it enabled him to verify his ideas by actual experiment; he also laid stress on the fact that it encouraged good craftsmanship, and was thus an antidote to the effect of mass-production methods. For the benefit of the model builders present, Sir Nigel then went on to describe some of the principles of locomotive construction and made reference to some of the features of modern locomotive design.

Mr. W. S. Tennant proposed a vote of thanks to Sir Nigel Gresley.

A tour of the hall will show that model engineering is an ever-growing pursuit, both in the number and the varying interests of its many followers. The exhibition is now well established as a recognised rallying point for model engineers from all over the country to meet together, to display their work, and to examine and purchase the latest workshop equipment and materials for their use. The competition section contains some remarkable examples of patient and skilful craftsmanship, and represents handicraft and ingenuity at its best. A feature of the exhibition is the range of exhibits made by the various clubs and societies whose members follow some form of model making as a hobby.

In the trade section, the various exhibiting firms show a complete range not only of tools and materials, but of

finished models, and of parts and accessories for every kind of model making. The beginner as well as the most advanced worker will find his needs amply catered for.

Staff and Labour Matters

Road Transport Wages

On September 9, at the Ministry of Labour, the Wages Committee of the Joint Industrial Council of the passenger transport industry of Great Britain heard an application from the Transport and General Workers' Union for an increase in wages and improved conditions of service for all passenger transport employees who come within the purview of the national agreement of the Joint Industrial Council. Sir John Timpson, Chairman of the Joint Industrial Council, presided.

The application, which affects employees of the passenger-carrying industry, as far as municipally-owned undertakings are concerned, was for an increase in wages of 4s. 0d. a week and improved conditions of labour, including spreadover overtime, and an increase in the number of paid holidays. Mr. Harold Clay occupied the time of the first sitting in putting the case of the men, and the hearing was adjourned until today (September 17) when the employers will discuss the reply to the application.

ISLE OF MAN AIR ROUTES REORGANISATION.—It is officially announced that agreement has now been reached between the London Midland & Scottish Railway Company, the Isle of Man Steam Packet Company, and Olley Air Service Limited, for a fusion of their interests in the internal air line operations radiating from the Isle of Man. This fusion is a step towards the internal airways unification forecast in our issue of August 20.

L.N.E.R. "GREEN ARROW" CLASS LOCOMOTIVE NAMED "THE SNAPPER."—At Hull Paragon station, on September 11, the L.N.E.R. V2 ("Green Arrow") class locomotive No. 4780 was officially named *The Snapper* by Brig.-Gen. J. L. J. Clarke, C.M.G., Colonel of the East Yorkshire Regiment. The naming is to commemorate the coronation of King George VI, Colonel-in-Chief of the regiment. "Snappers" is the colloquial name of the East Yorkshires, dating from the eighteenth century. The nameplate of the engine is also inscribed, "East Yorkshire Regiment—Duke of York's Own." Mr. C. M. Jenkin Jones, Divisional General Manager, North-Eastern Area, presided at the ceremony, and Mr. E. Thompson, Mechanical Engineer, North-Eastern Area, formally handed the engine over for traffic. Other L.N.E.R. North-Eastern Area officers present were:—

Mr. S. T. Burgoyne (Superintendent), Mr. C. M. Stedman (Locomotive Running Superintendent, York), Mr. E. M. Rutter (Passenger Manager, York), Mr. G. Sowerby (Estate and Rating Surveyor, York), Mr. J. S. Harper (District Superintendent, Hull), Mr. E. V. Taylor (District Goods Manager, Hull), Mr. F. H. Colebrook (District Engineer, Hull).

Forthcoming Events

Sept. 16-25.—*The Model Engineer* Exhibition, at Royal Horticultural Hall, Vincent Square, London, S.W.1.

Sept. 25 (Sat.).—Permanent Way Institution (Manchester-Liverpool), at Blackpool, 3 p.m. "Railway Drainage," by Mr. F. McCandlish.

Sept. 30 (Thurs.).—Permanent Way Institution (Brighton), at Welfare Room, Eastbourne, 7 p.m. "Leads of Crossings on Basis of Unit Angles," by Mr. R. Gurd.

Oct. 4 (Mon.).—Yorkshire Transport Society, at County Restaurant, Bridge Street, Bradford, 7.30 p.m. "The Story of the London Bus."

Stephenson Locomotive Society, at King's Cross Station, N.1. 6.30 p.m. Lantern Lecture, "The Control of Train Speeds on the G.W.R.," by Mr. C. T. Roberts, B.Sc., A.M.I.Mech.E.

Oct. 5 (Tues.).—L.N.E.R. (York) Lecture and Debating Society, at Railway Inst., Queen Street, 6.45 p.m. "A Survey of Modern British Signalling Installations," by Mr. C. Carslake.

NOTES AND NEWS

Northern Counties Committee (L.M.S.R.).—Traffic receipts of the Northern Counties Committee for the first 35 weeks of the current year amount to £278,800, an increase of £2,596.

Agreed Charges.—One hundred more applications for the approval of agreed charges have been lodged with the Railway Rates Tribunal, as will be seen from the legal notice published on page 494. A copy of each application (1s. post free) may be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, S.W.1. Notices of objection must be filed on or before October 5, 1937.

Engineering and Marine Exhibition at Olympia.—The Engineering and Marine Exhibition, which opened at Olympia yesterday, and continues until October 2, includes among its numerous features of general engineering interest, a section devoted to welding. The stands of welding exhibitors cover more than 15,000 sq. ft., and the displays are arranged to give practical assistance to those engaged in, or intending to undertake, the art; as well as to show the rapid progress of welding technique in all branches of engineering.

Railway Standard Charges.—Statutory Rules and Orders have now been published embodying the changes in the schedules of standard charges of the four main line companies which are to become operative on October 1 as a result of the general 5 per cent. increase granted last July by the Railway Rates Tribunal. The amended schedules are generally similar for all four companies except as to goods and coal traffic carried in company's wagons in Scotland on the L.M.S.R., and in Scotland and part of the North Eastern Area on the L.N.E.R., and as to Kent coal traffic carried in company's wagons on the Southern Railway. There is also a special note as to boat express train fares on the Southern.

Evening Classes for G.W.R. Employees.—Evening classes and correspondence courses arranged by the Great Western Railway to enable the staff in all grades to increase their knowledge and efficiency, will begin shortly, and already some 10,000 employees have enrolled. The classes will cover courses in signalling, accountancy, goods rates and station working, and first aid, and will be held at all the big centres and many smaller stations on the system. Reasonable leave of absence, where necessary, and free travel facilities will be given to enable students to attend. Facilities will also be granted to employees of the Great Western Railway to attend a special course of lectures at the London School of Economics, which will extend their knowledge of railway subjects and will enable those aspiring to a degree to sit for the examinations for the degrees of B.Sc.

(Econ.) and B.Com. In addition, classes in commercial and economic subjects for the company's employees, organised by the L.C.C., will be held at Paddington.

Withdrawal of Train Service on Westport-Achill Branch G.S.R.—The Great Southern Railways of Ireland announces that on and after October 1, it will cease running a service of trains on the Westport to Achill branch line. A motorbus service will in future be run between these places providing two services daily in each direction. Motor lorries will be provided for the conveyance of merchandise traffic and livestock. For the convenience of the public it is proposed to establish depots for the reception and delivery of general merchandise at Mallaranny and Achill.

Collectivisation in Catalonia.—The Barcelona *Official Gazette* of August 19 last, published a circular dated August 11, signed by the President of the Catalan Council of Economy, and countersigned by the various syndicates (including the CNT., UGT., FAI., and the P.O.U.M., the Esquerra and the United Catalan Socialist Party) calling upon all industrial or commercial undertakings to legalise their position under the Decree of Collectivisation of October 24, 1936, before September 15. After this date any form of working established since July 19, 1936, which is not in accord with existing legislation, will be considered outside the law and guilty of sabotage of the new economy.

G.W.R. Winter Train Services.—It is announced by the G.W.R. that from September 27 the 8.55 a.m. express from Paddington to Fishguard Harbour will be accelerated by 31 min., and the 8.15 a.m. from Fishguard Harbour to Paddington by 40 min., chiefly by means of the excision of stops in South and West Wales. The 6.55 p.m. express from Paddington to Newport and Cardiff—the fastest passenger train on the South Wales service, introduced in July last—is being continued for the winter on weekdays other than Saturdays, and also the 4.20 p.m. from Cheltenham to Paddington, reinstated in the timetable in July last after suspension during the previous winter. Certain Sunday services which hitherto have run during the summer only will also be continued during the winter months.

The Bihta Derailment, East Indian Railway.—As no conclusive finding has been arrived at in the inquiries into the cause of this accident held to date, the Government has ordered a judicial inquiry. It appears that the driver of a train which passed the site of the accident about 7 hr. beforehand reported on arrival at Dinapore (a neighbouring station) that he had heard noise and felt oscillation at this spot, states a Reuters message. It is consequently surmised that the track may have been tampered with, and the possibility of sabotage is not ruled out,

especially as there was a serious accident in 1932 at a point only 4½ miles away, and inquiry proved that this accident was the work of train wreckers. According to the *Daily Express* of September 9, experiments are to be made with an engine and seven coaches similar to those involved in the derailment, at gradually increasing speeds up to 40 m.p.h., and over similar track conditions, but at Jamalpur, where the principal E.I.R. locomotive shops are situated. The test train is expected to be derailed completely in the last test, and our contemporary quotes the estimated cost of the experiments at £30,000 in damage to stock and track.

Road Accidents.—The Ministry of Transport return for August of persons killed or injured in road accidents is as below. The figures in brackets are the fatalities for the corresponding period of last year:—

		Injured		
		Killed	Serious	Slight
England—				
Pedestrians	179 (197)	1,085	3,831
Others	335 (313)	3,442	11,769
Wales—				
Pedestrians	10 (7)	57	205
Others	25 (21)	206	513
Scotland—				
Pedestrians	29 (25)	186	505
Others	34 (42)	321	993
		612 (605)	5,297	17,816

The total fatalities for the preceding month were 607, compared with 589 in the corresponding period of 1936.

Lantern Lecture on Electric Heat-Treatment Furnaces.—Wild-Barfield Electric Furnaces Limited has completely revised the lantern lecture material on electric heat-treatment furnaces which was made available with great success last year. Several sets of slides have been prepared, and, with descriptive material relating to the furnaces illustrated, will be despatched free of charge to societies, technical schools, and other institutions, on receipt of a few days' notice. Application for the lectures, or for additional information, should be made to Wild-Barfield Electric Furnaces Limited.

Scottish Train Service Improvements, L.M.S.R.—Although the 3-hour summer expresses between Glasgow and Aberdeen will be withdrawn on the introduction of the winter service on September 27, the latter will in several respects be an improvement on the services of previous years. The 10.5 a.m. Granite City from Glasgow to Aberdeen, resuming all its nine intermediate stops, will take 3½ hours and be 12 minutes quicker than last winter. The 1.40 p.m. will take 3 hours 50 minutes, an acceleration of 8 minutes, and the 5 p.m., 3 hours 37 minutes, which is 6 minutes quicker; certain up trains also are quickened by 5 minutes. The 6.20 a.m. from Helmsdale to Inverness will arrive 36 minutes earlier than last winter, and the 8.50 a.m. from Wick to Inverness will start at 9 a.m. and be accelerated 20 minutes. Slight quickenings will take place in the Glasgow—Edinburgh service, and the non-stop 1.20 p.m. from Glasgow will become a 60-minute train.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 36th Week			Totals to Date		
	1937	1936	Inc. or Dec.	1937	1936	Inc. or Dec.
L.M.S.R. (6,870½ mls.)	£	£	£	£	£	£
Passenger-train traffic...	558,000	540,000	+ 18,000	19,265,000	18,500,000	+ 765,000
Merchandise, &c. ...	499,000	497,000	+ 2,000	17,474,000	16,984,000	+ 490,000
Coal and coke ...	223,000	221,000	+ 2,000	9,056,000	8,566,000	+ 490,000
Goods-train traffic ...	722,000	718,000	+ 4,000	26,530,000	25,550,000	+ 980,000
Total receipts ...	1,280,000	1,258,000	+ 22,000	45,785,000	44,050,000	+ 1,745,000
L.N.E.R. (6,315 mls.)						
Passenger-train traffic...	378,000	372,000	+ 6,000	12,624,000	12,043,000	+ 581,000
Merchandise, &c. ...	336,000	323,000	+ 13,000	12,020,000	11,584,000	+ 436,000
Coal and coke ...	236,000	211,000	+ 25,000	8,789,000	8,264,000	+ 525,000
Goods-train traffic ...	572,000	534,000	+ 38,000	20,809,000	19,848,000	+ 961,000
Total receipts ...	950,000	906,000	+ 44,000	33,433,000	31,891,000	+ 1,542,000
G.W.R. (3,738½ mls.)						
Passenger-train traffic...	235,000	239,000	- 4,000	8,143,000	7,909,000	+ 234,000
Merchandise, &c. ...	208,000	197,000	+ 11,000	7,111,000	6,823,000	+ 288,000
Coal and coke ...	115,000	100,000	+ 15,000	3,990,000	3,572,000	+ 418,000
Goods-train traffic ...	323,000	297,000	+ 26,000	11,101,000	10,395,000	+ 706,000
Total receipts ...	558,000	536,000	+ 22,000	19,244,000	18,304,000	+ 940,000
S.R. (2,157 mls.)						
Passenger-train traffic...	364,000	349,000	+ 15,000	12,144,000	11,519,000	+ 625,000
Merchandise, &c. ...	65,500	65,000	+ 500	2,199,500	2,258,500	- 59,000
Coal and coke ...	28,500	29,000	- 500	1,064,500	1,096,500	- 32,000
Goods-train traffic ...	94,000	94,000	-	3,264,000	3,355,000	- 91,000
Total receipts ...	458,000	443,000	+ 15,000	15,408,000	14,874,000	+ 534,000
Liverpool Overhead ...	1,337	1,264	+ 73	47,101	43,299	+ 3,802
Mersey (4½ mls.) ...	4,130	4,079	+ 51	149,981	144,893	+ 5,088
*London Passenger Transport Board ...	556,800	558,300	- 1,500	6,108,100	6,091,700	+ 16,400
IRELAND						
†Belfast & C.D. pass. (80 mls.)	2,958	3,255	- 297	99,907	100,781	- 874
" " goods	434	368	+ 66	17,312	19,772	- 2,460
" " total	3,392	3,623	- 231	117,219	120,553	- 3,334
Great Northern (543 mls.)						
" " goods	14,450	13,600	+ 850	412,750	402,200	+ 10,550
" " total	9,250	9,850	- 600	336,650	351,000	- 14,350
Great Southern (2,076 mls.)						
" " goods	23,700	23,450	+ 250	749,400	753,200	- 3,800
" " total	50,626	49,636	+ 990	1,358,215	1,346,093	+ 12,122
" " goods	41,748	40,064	+ 1,684	1,463,333	1,489,321	- 25,988
" " total	92,374	89,700	+ 2,674	2,821,548	2,835,414	- 13,866

* 11th week (before pooling)

† 37th week

Charges of Non-Amalgamated Railways

The non-amalgamated railway companies and committees to which Sections 35 and 38 of the Railway Act, 1921, refer, are seeking authority from the Railway Rates Tribunal, as will be seen from the legal notice on page 495, to apply to their respective schedules of standard charges and their exceptional rates the 5 per cent. increase recently granted by the tribunal to the four amalgamated companies. The proceedings of the tribunal for July 14, 1927, show that the standard charges schedule of one amalgamated company was allocated to each non-amalgamated railway. Thus, the L.M.S.R. schedule was made applicable to 19 railways, including the Birkenhead; Mersey; Midland & Great Northern Joint; Railways authorised by the Mid-Nottinghamshire Joint Railways Act, 1926; Tottenham & Hampstead Junction; and Whitechapel & Bow (subject to a proviso saving the rights of the District Railway). To 27 railways the L.N.E.R. schedule applied, including

Cheshire Lines; Forth Bridge; Hamersmith & City; Manchester South Junction & Altrincham; Metropolitan; Metropolitan & Great Central Joint Committee; Norfolk & Suffolk Joint Railways Committee; Oldham, Ashton & Guide Bridge Junction; Metropolitan & Metropolitan District Joint City Lines & Extension Railways (saving the rights of the District Railway); Port of London Authority; Southport & Cheshire Lines Extension; South Yorkshire Joint. The Great Western schedule was applied to twelve railways, including Great Western & Great Central Joint Lines; Severn & Wye & Severn Bridge; Shrewsbury & Hereford Joint; Shrewsbury & Wellington Joint; Shrewsbury & Welshpool Joint; West London; and West London Extension. Six railways had the Southern schedule, including the East London; Somerset & Dorset; and Weymouth & Portland. Notices of objection to the proposed increases must be lodged with the Registrar of the tribunal by October 1.

British and Irish Railway Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices	
			Sept. 15, 1937	Rise/Fall
G.W.R.				
Cons. Ord. ...	64½	45½	63	+1½
5% Cons. Prefce. ...	126½	116½	116½	—
5% Red. Pref. (1950) ...	113	108½	109½	—
4% Deb. ...	119½	110½	105½	—
4% Deb. ...	121	114	111	—
4% Deb. ...	129	121	116½	-1
5% Deb. ...	141	124	128½	—
2% Deb. ...	79½	74	69½	—
5% Rt. Charge ...	136½	130	127½	—
5% Cons. Guar. ...	135½	127½	124	—
L.M.S.R.				
Ord. ...	35½	17	30½	+½
4% Prefce. (1923) ...	83	52½	75½	—
4% Prefce. ...	92½	81	82	—
5% Red. Pref. (1955) ...	109½	103½	106	—
4% Deb. ...	113½	105½	101½	+½
5% Red. Deb. (1952) ...	119½	115½	112½	—
4% Guar. ...	106½	101½	99½	—
L.N.E.R.				
5% Pref. Ord. ...	14	9	10	+¼
Def. Ord. ...	7½	4½	47½	+½
4% First Prefce. ...	79½	55½	72	+½
4% Second Prefce. ...	317½	18½	28½	—
5% Red. Pref. (1955) ...	100½	77½	98	—
4% First Guar. ...	104½	98½	96	—
4% Second Guar. ...	99	90	89½	—
3% Deb. ...	85½	79	76	—
4% Deb. ...	109½	104½	100½	—
5% Red. Deb. (1947) ...	116½	110½	110½	—
4% Sinking Fund Red. Deb. ...	111½	107½	108	—
SOUTHERN				
Pref. Ord. ...	98½	82½	91	+1
Def. Ord. ...	27½	20½	21½	—
5% Pref. ...	120½	118½	113½	—
5% Red. Pref. (1964) ...	119½	115½	113½	—
5% Guar. Prefce. ...	136	129½	125	—
5% Red. Guar. Pref. (1957) ...	120	115½	114	—
4% Deb. ...	117½	109½	104	—
5% Deb. ...	140	134	126½	—
4% Red. Deb. ...	116½	110	106½	—
1962-67				
BELFAST & C.D.				
Ord. ...	9	4½	4	—
FORTH BRIDGE				
4% Deb. ...	107	105	101½	—
4% Guar. ...	107½	104	100½	—
G. NORTHERN (IRELAND)				
Ord. ...	19½	9½	7½	+½
G. SOUTHERN (IRELAND)				
Ord. ...	63	41	32½	+2½
Prefce. ...	65	46	40½	-1½
Guar. ...	97½	81	73	+1½
Deb. ...	99½	83½	88½	+2
L.P.T.B.				
4% "A" ...	127½	121	113½	—
5% "A" ...	138½	133½	125½	—
4% "T.F.A." ...	111½	108½	105	—
5% "B" ...	131½	123½	117½	—
"C" ...	112½	93	80	-1
MERSEY				
Ord. ...	40½	23	29½	—
4% Perp. Deb. ...	103	98	97	—
3% Perp. Deb. ...	78	74½	74½	—
3% Perp. Prefce. ...	68½	63½	66½	—

CONTRACTS AND TENDERS

Further L.M.S.R. Wagon Orders

The L.M.S.R. has placed orders for a total of 180 bolster wagons divided as follows:—

Fairfield Shipbuilding & Engineering Co. Ltd., 30 50-ton bogie bolster wagons.
Metropolitan-Cammell Carriage & Wagon Co. Ltd., 60 20-ton double bolster wagons.
Charles Roberts, 60 20-ton double bolster wagons.
Hurst Nelson & Co. Ltd., 30 20-ton double bolster wagons.

These orders follow on those recently placed by the L.M.S.R. for a total of 1,150 wagons, as recorded on this page in our issue of September 3.

G.W.R. 1938 Rolling Stock Programme

The G.W.R. annual 1938 renewal programme provides for the construction of 100 locomotives, 381 passenger vehicles and 3,600 wagons at Swindon. Of the passenger train vehicles 231 will be of the new standard corridor type with end vestibule doors for use on main line services, 75 non-corridor coaches for local services, 10 restaurant and new-type buffet cars, 30 fruit and flower louvre-ventilated vans and 10 cattle boxes (with attendant's compartment), designed specially for the conveyance of pedigree cattle by express passenger train. For working on through services to other company's lines, five of the corridor coaches will be fitted with adaptors for coupling to vehicles fitted with Pullman gangways. Of the non-corridor stock, seven coaches will be built to a modified profile for service on the Burry Port and Gwendreath section, and four coaches will be fitted with a driver's compartment and through regulator gear for push-and-pull working.

The five restaurant cars will each have a first and third class saloon with kitchen and pantry between. They will be furnished with settee type seats and the kitchens equipped with electric refrigerators. The five buffet cars will be the first of their type to be built by the company. In addition to a snack bar counter with eight "stand up rest seats," each car will provide seating accommodation for 20 passengers at small tables. The interior scheme of decoration will be carried out in green shaded panelling and all the furniture will be of the tubular type with fittings to match.

To cater for large pleasure parties, and works outings, a new ten coach centre vestibule train is to be built. Two of the coaches for this set will be kitchen cars each provided with two separate kitchens and a large pantry between, enabling meals to be dealt with more expeditiously.

All the passenger coaches will be built on the principle adopted by the company since 1922, with massive steel underframes, bodies entirely incased in steel on a timber framework and with steel roof. Over 11,000 tons of material will be required in the construction of the coaches, including 22,000 sheet panel plates, 150,000 cu. ft. of timber,

7,500,000 screws and 60 tons of paint and varnish.

The 3,600 new wagons will include 900 vacuum-fitted, of which 200 will be built specially for the conveyance of fruit and vegetable traffic. Three hundred flat-topped wagons are to be built. The total weight of material required in connection with the wagon programme will be about 27,000 tons of which about 3,600 tons will be timber and the other 23,400 tons will be mainly steel. The timber will consist of 228,000 cu. ft. of red deal and 6,500 cu. ft. of Baltic oak, teak and pitch pine. Included in the steel will be 6,000 tons of solid forged wheels and 1,800 tons of axles, whilst the remaining steelwork will consist mainly of rolled sections and plates secured by means of 315 tons of rivets and 220 tons of bolts and nuts.

Of the 100 new locomotives to be built, 10 will be of the "Castle" class, the remainder being for local or freight train working. Approximately 5,340 tons of metal will be required for the locomotive programme, including 230 tons of copper, 4,270 tons of steel, 740 tons of iron castings, and 100 tons of gun metal, about 55 miles of steel tube and 167,000 boiler stays. The total cost of the complete programme is expected to be in the region of £1,172,980, and will provide direct employment for 5,000 persons during 1938.

Goods Stock for South Africa

The Société Anglo-Franco-Belge de Matériel de Chemins de fer has received an order from the South African Government Railways and Harbours Board for 100 type V.29 bogie goods guards vans.

Machine Tools (India) Limited, has received orders from the Indian Stores Department for one Scott 12½ in. centres × 11 ft. gap bed high-speed "NM" type lathe.

Burn & Co. Ltd. has received an order from the Indian Stores Department for four sets of 1 in 8½ diamond crossings and 800 right-hand and 800 left-hand pressed steel axle guards.

Alfred Herbert (India) Limited has received orders from the Indian Stores Department for one Oldfield & Schofield 6-ft. 6-in. double railway wheel lathe, one electrically-driven swing-type jib crane, and one Herbert No. 16V vertical milling machine.

The Kumardhubi Engineering Works Limited has received an order from the Eastern Bengal Railway for one 85-ft. dia. mixed-gauge balanced-type turntable.

Greaves Cotton & Crompton Parkinson Limited has received orders from the Indian Stores Department for two Lister-Crompton diesel-electric generating sets.

W. H. Martin & Company has received an order from the Indian Stores Department for 2,530 13 in. broad-gauge buffer plungers.

Whitelegg & Rogers Limited has received a repeat order for four Nicholson Thermic Syphons for application to new locomotives under construction by Thunes Mek. Verksted of Oslo, for the Norwegian State Railways, and an order for four Nicholson Thermic Syphons for application to 4-6-2 type locomotives now under construction by the Vulcan Foundry Co. Ltd. for the Buenos Ayres Great Southern Railway. These Thermic Syphons are manufactured by Beyer Peacock & Co. Ltd.

Tenders are invited by the Chief Controller of Stores, Indian Stores Department (Electrical Section), Simla, receivable by October 5, for the supply, delivery and erection of a 6-cwt. passenger lift for the new Railway Divisional Offices building, Karachi.

Tenders are invited by the Chief Controller of Stores, Indian Stores Department (Engineering Section), Simla, receivable by October 25, for a number of machine tools, required for the Manmad workshops, G.I.P. Railway.

James Clement & Co., of 64, Victoria Street, London S.W.1, has been appointed agent for the Société Anglo-Franco-Belge de Matériel de Chemins de fer, La Croyère, Belgium, manufacturer of locomotives, carriages, wagons, and railway materials.

Exports of Railway Material from the United Kingdom in August

	Aug., 1937		Aug., 1936		Eight Months Ending Aug., 1937		Aug., 1936	
	£		£		£		£	
Locomotives, rail	104,865		59,890		756,263		1,012,242	
Carriages and wagons	214,299		41,582		2,088,644		868,735	
Rails, steel	181,826		124,270		998,107		908,654	
Wheels, sleepers, fishplates and miscellaneous materials	132,268		124,516		1,021,003		988,577	

Locomotive and rail exports included the following:—

	Locomotives		Rails	
	Aug., 1937	Aug., 1936	Aug., 1937	Aug., 1936
Argentina	10,424	7,984	4,097	1,637
Union of South Africa	—*	—*	7,335	76,210
British India	23,398	6,113	13,293	23,289

* Figures not available

LEGAL AND OFFICIAL NOTICES

In the Court of the Railway Rates Tribunal.
Road and Rail Traffic Act, 1933

Agreed Charges

NOTICE IS HEREBY GIVEN that Applications for the approval of Agreed Charges under the provisions of Section 37 of the Road and Rail Traffic Act, 1933, short

particulars of which are set out in the Schedule hereto, have been lodged with the Railway Rates Tribunal.

The Procedure to be followed in regard to the inspection of the said Applications and the filing of Notices of Objections is that published in the "London Gazette" of 28th July, 1936.

Printed copies of the Procedure can be obtained from the Railway Rates Tribunal, Bush House, Aldwych, London, W.C.2.

Notices of Objection to any of the said

Applications must be filed on or before the 5th October, 1937.

A copy of each Application can be obtained from Mr. G. Cole Deacon, Secretary, Rates and Charges Committee, 35, Parliament Street, Westminster, London, S.W.1, price 1s. post free.

T. J. D. ATKINSON,
Registrar.

13th September, 1937.

Number of Application	Name of Trader and General Description of Traffic	Number of Application	Name of Trader and General Description of Traffic
1937— No. 433	L. & J. WEBER & PHILLIPS LIMITED, West Road, Tottenham, London, N.17; Boots, Shoes and Leather.	1937— No. 475	RUDKIN LAUNDON & CO. LTD., 346, St. Saviours Road, Leicester; Hosiery and Knitted Wear.
1937— No. 434	WOODFORD & WORMLEIGHTON LIMITED, Langton Street, Leicester; Knitted Wear.	1937— No. 476	F. SHAPIRA & CO. LTD., 12, Commercial Street, London, E.1; Ladies' Outwear.
1937— No. 435	J. MORGAN, Square and Compass, Mathry Road, Pembroke; Rabbits (dead).	1937— No. 477	WOOLLEY SANDERS & CO. LTD., 72, 74, Wood Street, London, E.C.2; Hats, Millinery, etc.
1937— No. 436	VINE PRODUCTS LIMITED, "V.P." Winery, Kingston-on-Thames; Empty returned to the Trader.	1937— No. 478	T. A. & E. PEMBERTON LIMITED, 11, Blossom Street, Manchester, 1; Old Periodicals.
1937— No. 437	VINE PRODUCTS LIMITED, "V.P." Winery, Kingston-on-Thames; British Wines.	1937— No. 479	SCOTTISH OILS LIMITED, 53, Bothwell Street, Glasgow, C.2; Candles and Tapers.
1937— No. 438	THE BRITISH ESSENCE CO. LTD., 357-359, Kennington Lane, London, S.E.11; Fruit Essences, Essential Oils, Druggists' Sundries, etc.	<i>Applicable also to traffic consigned by nine Associated or Subsidiary Companies.</i>	
1937— No. 439	BRINTONS LIMITED, Kidderminster; Carpets, Rugs, etc.	1937— No. 480	W. D. EVANS, Mount Pleasant, Capel Evan, Newcastle Emlyn, Carmarthenshire; Rabbits (dead).
1937— No. 440	GERALD CARTER & CO. LTD., 72, Bridge Road East, Welwyn Garden City, Herts; Paints, Varnishes, etc.	1937— No. 481	CHARLES WEBBER & CO., Bonhay, Exeter; Sports Apparatus and Turnery Ware.
1937— No. 441	J. A. CHAPMAN LIMITED, Industry Tool Works, Woodside Lane and Rutland Road, Sheffield, 3; Tools. <i>Applicable also to traffic consigned by two Associated or Subsidiary Companies.</i>	1937— No. 482	WORLDWIDE WHOLESALE WAREHOUSE, Charles Street, Manchester, 1; Clothing, Drapery and General Stores Wares.
1937— No. 442	FAUDS LIMITED, 40, Newgate Street, London, E.C.1; Drapery, Fancy Goods, etc.	1937— No. 483	THE CELLULAR CLOTHING CO. LTD., 14, Moor Lane, London, E.C.2; Shirts and Underwear.
1937— No. 443	THE ROSEBINE CO. LTD., Oak Street, Carrington, Nottingham; Cotton Goods.	1937— No. 484	A. J. BALCOMBE LIMITED, 52-58, Tabernacle Street, London, E.C.2; Gramophones, Wireless Apparatus, etc.
1937— No. 444	LAWRENCE CABINET LIMITED, Minerva Works, Fazeley Street, Birmingham, 5; Bedsteads and Bedstead Fittings, Folding Tables, etc.	1937— No. 485	WHITEFIELDS LIMITED, Greengate, London, E.13; Confectionery, etc.
1937— No. 445	THE MAZAWATTEE TEA CO. LTD., Tower Hill, London, E.C.3; Tea, Coffee, etc. <i>Applicable also to traffic consigned by one Associated or Subsidiary Company.</i>	1937— No. 486	CARLTONA LIMITED, Victoria Road, Willesden Junction, London, N.W.10; Confectionery, Groceries, etc.
1937— No. 446	MILLAR & LANG LIMITED, 46 to 50, Darnley Street, Glasgow, S.1; Printed Matter, Stationery, etc.	1937— No. 487	WILLIAM YEAL, 8, Beachfield Avenue, Newquay, Cornwall; Rabbits (dead).
1937— No. 447	FREDERICK C. MILLER LIMITED, Millora Works, Southdenes, Great Yarmouth; Slippers.	1937— No. 488	MINIMAX LIMITED, Feltham, Middlesex; Fire Extinguishers, etc.
1937— No. 448	MILTON PROPRIETARY LIMITED, John Milton House, 10-12, Brewery Road, London, N.7; Milton Fluid; Dental Cream and Powder, etc.	1937— No. 489	HAIGH & SONS LTD., Norwood Mill, Southall; Fireplace Ornaments, Domestic Woodware, etc.
1937— No. 449	RICHARD WHEEN & SONS LTD., Soapery, Deptford Creek, London, S.E.8; Soap, etc.	1937— No. 490	WORLDWIDE WHOLESALE WAREHOUSES, Charles Street, Manchester, 1; Furniture and Household Requisites.
1937— No. 450	WORKWEAR LIMITED, Mount Vernon, Liverpool, 7; Slips.	1937— No. 491	SAM. HANSON & SON LTD., 14, Eastcheap, London, E.C.3; Confectionery, Groceries, etc.
1937— No. 451	GEORGE BRETTELL & CO. LTD., 119, Wood Street, London, E.C.2; Cotton, Woollen and Silk Goods, etc.	1937— No. 492	CLAYTON MAYERS & CO. LTD., North Circular Road, London, N.W.2; Glassware, etc.
1937— No. 452	W. & G. BROWN, Lodge Lane, Derby; Barley Kernels.	1937— No. 493	ALFRED ADAMS & CO. LTD., Reliance Works, West Bromwich; Glue, etc.
1937— No. 453	POWELL BROS. LTD., 40, St. Martin's-le-Grand, London, E.C.1; Confectionery, Groceries, Preserves, Provisions, etc.	1937— No. 494	CALDER SOAP CO. LTD., Ashby-de-la-Zouch; Soap, etc.
1937— No. 454	H. J. HEINZ CO. LTD., Harlesden, London, N.W.10; Groceries, Preserves and Provisions.	1937— No. 495	DAILEY & CO. LTD., Northumberland Park, London, N.17; Paper Covers, etc.
1937— No. 455	HUDSON & WRIGHT LIMITED, Grove Street, Birmingham, 18; Brass and Copper Tubes.	1937— No. 496	GENT & CO. LTD., Faraday Works, St. Saviour's Road, Leicester; Electrical Apparatus, Machinery, etc.
1937— No. 456	PETER KEYVIL & SONS LTD., 370, Edgware Road, London, W.2; Groceries, Preserves, Provisions, etc.	1937— No. 497	J. LEGGE & CO. LTD., Willenhall, Staffs; Hardware, etc.
1937— No. 457	MALETTE, PORTER & DOWD LIMITED, 465, Caledonian Road, London, N.7; Clothing, Blankets, etc.	1937— No. 498	MACLEANS LIMITED, Great West Road, Brentford, Middlesex; Druggists' Sundries, etc.
1937— No. 458	H. SAMUEL LIMITED, Hunters Road Works, Hockley, Birmingham, 19; Clocks, Cutlery, etc. <i>Applicable also to traffic consigned by five Associated or Subsidiary Companies.</i>	1937— No. 499	MARTINEAU LIMITED, Mark Lane Station Buildings, London, E.C.3; Golden Syrup, Sugar, etc.
1937— No. 459	THE STUFFOLK IRON FOUNDRY (1920) LIMITED, Gipping Works, stowmarket; Mangles, Miners, Machines, etc.	1937— No. 500	NEWMAN'S SLIPPERS LIMITED, Griffin Works, Blackburn; Slippers (Felt).
1937— No. 460	TEETGEN & CO. LTD., Teetgen's Warehouse, New Street, Bishopsgate, London, E.C.2; Confectionery, Groceries, Preserves, Provisions, etc.	1937— No. 501	TREMLETTS LIMITED, Exeter; Leather, Hides, etc.
1937— No. 461	W. H. DAVIES, Maenclochog; Rabbits (dead).	1937— No. 502	JAMES WATKINSON & SONS LTD., Washpit Mills, Holmfirth, near Huddersfield; Woollens, etc.
1937— No. 462	THE DISTRIBUTORS AND TRANSPORTERS LIMITED (MESSRS. UNILEVER'S DISTRIBUTING ORGANISATION), Unilever House, Blackfriars, London, E.C.4; Butter and Margarine ex Manufacture.	1937— No. 503	JOSEPH ARMITAGE, SON & CO. LTD., 5, Minorities, London, E.C.3; Tea, Coffee, China, etc.
1937— No. 463	ROSE, MORRIS & CO. LTD., 57, City Road, London, E.C.1; Musical Instruments and Musical Toys.	1937— No. 504	HENRY BRUCE & SONS LTD., Kildeth Mill, Currie, Midlothian; Paper.
1937— No. 464	JOHN ROYLE & CO. LTD., 36 and 38, Dantzic Street, Manchester, 4; Boots, Shoes and Drapery.	1937— No. 505	THE CRESCENT TOY CO. LTD., 8, Fountain Road, South Tottenham, London, N.15; Toys, etc.
1937— No. 465	N. SEAL, Picton Works, Picton Lane, Swansea; "Kwikpuf" Puff Paste.	1937— No. 506	ELLIOTT OF NEWBURY LIMITED, Albert Works, Newbury; Chairs, in cartons.
1937— No. 466	DRAITHWAITE'S, 12, Embledon Street, Liverpool; Cooked Meats	1937— No. 507	THE ENFIELD CYCLE CO. LTD., Enfield Works, Redditch; Bicycles, Motor Cycles, Motor Mowers, etc.
1937— No. 467	GEORGE BRETTELL & CO. LTD., 119, Wood Street, London, E.C.2; Gloves, Hosiery and Textiles.	1937— No. 508	FULLERS LIMITED, Hammersmith, London, W.6; Confectionery, etc.
1937— No. 468	COSSE & MORRIS LIMITED, Shannon Street Mills, Leeds, 9; Clothing and Raincoats.	1937— No. 509	THOS. GUEST & CO. LTD., Carruthers Street, Ancoats, Manchester, 4; Pharmaceutical Products.
1937— No. 469	F. HODGSON & SONS, Woodsley Road, Leeds; Blankets, Carpets, Drapery, etc.	1937— No. 510	THE HALFORD CYCLE CO. LTD., 239, Corporation Street, Birmingham; Bicycles, Batteries, Toys, etc.
1937— No. 470	THE IMPERIAL TOBACCO CO. (OF GREAT BRITAIN AND IRELAND) LTD., East Street, Badminton, Bristol; Cigarettes and Tobacco.	1937— No. 511	J. HEPWORTH & SON LTD., Leeds, 2; Clothing, Hats, etc.
1937— No. 471	M. IZBICKI LIMITED, 49-53, Poland Street, Oxford Street, London, W.1; Clothing, etc.	1937— No. 512	KRAFT PRODUCTIONS LIMITED, Kraft Works, Cornboro Place, Bridgewater, Somerset; Woven Fabric Furniture, etc.
1937— No. 472	E. MILES & CO., The Bacon Factory, West Street, Bristol, 2; Bacon, Cheese, etc.	1937— No. 513	MALGA (LONDON) LIMITED, Southall, Middlesex; Confectionery and Fondant Sugar.
1937— No. 473	THOMAS RATCLIFFE & CO. LTD., Albert Mills, Mytholmroyd; Blankets.	1937— No. 514	THE METTOY CO. LTD., 70, Finsbury Pavement, London, E.C.2; Toys.
1937— No. 474	A. RIDDELL & CO. LTD., East Parade, Bradford, Yorks; Costumes, etc.	1937— No. 515	THE SOUTHERN OIL CO. LTD., Trafford Park, Manchester, 17; Edible Oils and Lard Compound.
		1937— No. 516	W. TREVOR WATKINS, Ystrad Mynach; Cattle, Calves, Pigs and Sheep.
		1937— No. 517	YEATMAN & CO. LTD., Denmark Street, London, E.1; Groceries, Preserves, Provisions, etc.
			<i>Applicable also to traffic consigned by one Associated or Subsidiary Company.</i>
		1937— No. 518	CROFTS (ENGINEERS) LIMITED, Thornbury, Bradford, Yorks; Gears, Pulleys, etc.
		1937— No. 519	WILLIAM GOODACRE & SONS LTD., Ceylon Mills, Russell Road, Victoria Docks, London, E.16; Carpeting, etc.

Legal and Official Notices—continued.

Number of Application	Name of Trader and General Description of Traffic	Number of Application	Name of Trader and General Description of Traffic
1937— No. 520	KERSANS LIMITED, 25, Bath Street, Leith; Bacon, etc.	1937— No. 528	WHYTE, RIDSDALE & CO. LTD., 74, 75 and 76, Houndsditch, Bishopsgate, London, E.C.3; General Stores Wares, etc. <i>Applicable also to traffic consigned by one Associated or Subsidiary Company.</i>
1937— No. 521	MACLEANS LIMITED, Great West Road, Brentford, Middlesex; Tooth Paste, etc.	1937— No. 529	WIGGINS, TEAPE AND ALEX PRIE (SALES) LIMITED, 46/58, Mansell Street, Aldgate, London, E.1; Paper.
1937— No. 522	B. BERWIN LIMITED, Berbourne House, Roseville Road, Leeds; Clothing.	1937— No. 530	JOHN C. GYNN, "Treslay," Boscastle, Cornwall; Rabbits (dead).
1937— No. 523	FABRAM LIMITED, Station Works, Halifax; Motor Car and Cycling Equipment, etc.	1937— No. 531	PURERS LIMITED, 16, Church Road, Thame, Oxon; Clothing, etc.
1937— No. 524	NORTON MOTORS LIMITED, Bracebridge Street, Birmingham, 6; Motor Bicycles.	1937— No. 532	T. W. HUDSON & SONS, 11, Wharf Street, Stockton-on-Tees; Joinery Work. <i>Applicable also to traffic consigned by one Associated or Subsidiary Company.</i>
1937— No. 525	PAUL WALSER & CO. LTD., Reslaw House, Great Marlborough Street, London, W.1; Hats, Millinery, etc.		
1937— No. 526	MAHS CONFECTIONS LIMITED, Trading Estate, Slough; Confectionery.		
1937— No. 527	WAKELEY BROS. & CO. LTD., Honduras Wharf, Bankside, London, S.E.1; Agricultural and Garden Seeds, Garden Ornaments, etc.		

In the Court of the Railway Rates Tribunal.

Railways Act, 1921

APPLICATION FOR THE MODIFICATION OF STANDARD AND EXCEPTIONAL CHARGES OF NON-AMALGAMATED RAILWAY COMPANIES.

NOTICE IS HEREBY GIVEN that pursuant to the provisions of Sections 35 and 36 of the Railways Act, 1921, an Application has been lodged with the Railway Rates Tribunal by the Railway Companies or the Owners of the Railways to which the Schedules of Standard Charges of the Amalgamated Railway Companies have been applied for an Order directing that the Schedules of Standard Charges as applied to each of the said Non-Amalgamated Railway Companies or Owners of Railways be modified to the extent and in the manner and subject to the rules set out in Statutory Rules and Orders, 1937, Nos. 803, 804, 805 and 806, and that the Exceptional Charges at present in operation be increased by five per cent., such increase to be calculated in accordance with the terms of the Orders dated 27th July, 1937, made in respect of the Amalgamated Companies.

The said Application may be inspected at the office of the Registrar of the Court, Bush House, Aldwych, London, W.C.2, during office hours, and copies of the same can be obtained from Mr. G. Cole Deacon, Secretary of the Rates and Charges Committee, 35, Parliament Street, Westminster, London, S.W.1, price 1s. post free.

Notice is further given that by an Order of the Registrar of the Court dated 13th September, 1937, it was directed that any body or person desirous of attending or being heard at the consideration by the Court of the said Application must lodge a written Notice of such desire, setting forth in such Notice their or his objection, with the Registrar of the Court at his office, Railway Rates Tribunal, Bush House, Aldwych, London, W.C.2, on or before Friday, the first day of October, 1937.

Each Notice filed must be stamped with an adhesive fee stamp for 2s. 6d. which can be purchased at the office of the Tribunal only.

Six additional copies of each Notice of Objection must be lodged with the original at the office of the Registrar.

Dated this 13th day of September, 1937.
T. J. D. ATKINSON,
Registrar.

Railway Rates Tribunal,
Bush House,
Aldwych,
London, W.C.2.

The Manchester Ship Canal Company

THE RAILWAY AND CANAL TRAFFIC ACT, 1888.

NOTICE OF INCREASE OF RAILWAY RATES.

RESPECTING the notice (which has been publicly advertised) under date of 1st September, 1937, of increase of Rates, Tolls and other Charges by the Railway Companies whereby certain increases in Rates, Tolls and other Charges for traffic carried by merchandise train between places in Great Britain are to come into force on the first day of October, 1937, Notice is hereby given pursuant to the Railway and Canal Traffic Act, 1888, and the Order of the Board of Trade thereunder, dated the 25th day of January, 1889, that in consequence of the before-mentioned notice the Manchester Ship Canal Company intend to increase the THROUGH RATES inclusive of Manchester Ship Canal Tolls and Wharfage Rates in operation with the Manchester Ship Canal, published in the books required by Act of Parliament to be kept for public inspection for the carriage of traffic by merchandise train and that the altered rates are to come into force on the first day of October, 1937.

The Company will issue as soon as possible amended schedules of Through Rates inclusive of Manchester Ship Canal Tolls and Wharfage Rates.

By Order,
LESLIE ROBERTS,
General Manager.

Ship Canal House,
Manchester, 2,
13th September, 1937.

South Indian Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of:—
STEELWORK FOR BRIDGES.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Company Limited, marked "Tender for Steelwork for Bridges," with the name of the firm tendering, must be left with the undersigned not later than 12 Noon on Wednesday, the 6th October, 1937.

The Directors do not bind themselves to accept the lowest or any Tender.
A charge, which will not be returned, will be

made of 10s. for each copy of the Specification. Copies of the drawing may be obtained at the Offices of the Company's Consulting Engineers, Messrs. Robert White & Partners, 3, Victoria Street, S.W.1.

E. A. S. BELL,
Managing Director.
91, Petty France,
Westminster, S.W.1.
15th September, 1937.

London and North Eastern Railway

NOTICE IS HEREBY GIVEN that, for the purpose of preparing the warrants for interest payable on the 15th October, 1937, on the Company's 5 per cent. Redeemable Debenture Stock, the balance will be struck as at the close of business on 28th September, and such interest will be payable only to those Stockholders whose names are registered on that date.

Transfers of the 5 per cent. Redeemable Debenture Stock should, therefore, be lodged with the Registrar of the Company at Hamilton Buildings, Liverpool Street Station, London, E.C.2, before 5 p.m. on 28th September.

By Order,
JAMES McLAREN,
Secretary.

Marylebone Station,
London, N.W.1.
16th September, 1937.

University of London Commerce Degree Bureau

THE Official Institution of the University providing Study Courses for External Students preparing for the Commerce Degree Examinations of the University of London, who are unable to attend regular College Lectures.

For Prospectus apply to Secretary (Mr. H. J. Crawford, B.A.), Commerce Degree Bureau, University of London, W.C.1.

WANTED by the Mechanical Department of a British Railway in the Argentine, Experienced Mechanical Engineering Draughtsman or Estimator. Comprehensive experience in taking out quantities and compilation of estimates for varied classes of work essential. Applications in confidence, giving full particulars of age, experience, training, present position, and if married or single, by letter to "A.F." c/o J. W. VICKERS & Co. Ltd., 24, Austin Friars, E.C.2.

L.M.S.R. EDUCATIONAL AND INSTRUCTIONAL FILMS PROGRAMME FOR 1937-38.—Steps are being taken by the L.M.S.R. to intensify the film side of its activities. In readiness for the 1937-38 season, an additional travelling film unit has been built, and this along with the other two units belonging to the company, will shortly go on tour throughout the whole of the system. A production programme involving five new talking films is also nearing completion, and these will be exhibited by the travelling units. The L.M.S.R. film activities are concerned first with educational films which, embracing railway activities in general, are shown to both the staff and

traders, and secondly, with instructional films exhibited solely to the staff.

The educational film unit which opens its tour at Euston on September 27, afterwards visiting 60 different centres in England, Scotland and Wales, gives shows in halls at the places chosen. It will exhibit four films this winter. These include "Sentinels of Safety" (a graphic description of railway signalling); "Cargo" (the story of the L.M.S.R. as the largest owner of docks and ports in Great Britain); and "Events of 1937," a railway commentary of the present year. The two mobile film units will, beginning on October 25, make an extensive tour

of Scotland. They will exhibit "Station Working" and "Anytown," two films which, although familiar to the English and Welsh staff of the company, have not yet been seen across the Border.

By completing the Scottish tour this year the units can begin a fresh tour in England and Wales early in 1938, when the two new films "Enemy No. 1" (concerned with accidents and how to avoid them), and "Salesmanship" (dealing with the creed of the successful business-getter), are to be exhibited. Accommodation booked at halls and, in the case of the mobile units, arrangements made with the staff, promise audiences totalling 93,350.

Railway Share Market

Conditions in all sections of the Stock Exchange have again been reactionary, pending an easing of tension in international affairs. Home railway stocks were unresponsive to good traffic figures, but although lower on balance for the week, they were steadier than most other sections of the market. This is largely explained by the fact that in the current half-year to date traffic receipts have been in excess of most expectations and the belief that the upward movement in receipts can be expected to receive a stimulus next month when they will reflect the higher transport charges.

Market men are giving more attention to the possibilities attaching to L.N.E.R. second preference stock in view of the encouraging trend in the railway's traffic. In respect of the past week the latter rose

by £44,000. It may be recalled that the half-yearly figures showed that of the £1,222,400 increase in gross receipts, as much as £770,000 was retained as a gain in net receipts, and interims on the first preference stock were resumed with a payment of 1 per cent. On present indications there seem reasonable prospects of a larger dividend on the second preference stock than the $\frac{1}{2}$ per cent. paid for 1936. L.M.S.R. ordinary was affected this week by disappointment with the £22,000 traffic gain, a larger increase having been expected. Although the Great Western figures, which show a similar gain, were regarded as quite satisfactory, the ordinary stock was lower. Southern deferred also moved against holders, as did the preferred, although the latter attracted buyers because of the yield now offered.

It is believed in many quarters that the question of a larger dividend on the deferred is likely to turn a good deal on the extent to which the railway benefits from the higher railway charges. London Transport "C" was dull, awaiting the past year's results.

Foreign railway stocks again moved against holders, having been dominated entirely by the general trend of markets. Argentine stocks remained out of favour owing to a disposition to await the past year's results. Preference dividend decisions of the B.A. Gt. Southern and B.A. Western are expected early next month. San Paulo were a relatively steady feature, pending the interim dividend announcement. Canadian Pacific and American railway stocks fluctuated sharply.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

Railways	Miles open 1936-37	Week Ending	Traffic for Week		No. of Weeks	Aggregate Traffic to Date			Shares or Stock	Prices						
			Total this year	Inc. or Dec. compared with 1936		Totals		Increase or Decrease		Highest 1936	Lowest 1936	Sept. 15, 1937	Yield (See Note)			
						This Year	Last Year									
			£	£		£	£	£								
South & Central America	Antofagasta (Chili) & Bolivia	834	12.9.37	22,070	+	8,820	37	609,280	498,890	+	110,390	Ord. Stk.	25	151 1/2	191 1/2	Nil
	Argentine North Eastern	753	11.9.37	11,582	+	1,611	11	112,272	100,039	+	12,233	"	12	2	10 1/2	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	—	—	A. Deb.	54	45	85	41 1/2
	Bolivar	174	Aug., 1937	4,800	—	100	35	45,600	52,500	—	6,900	6 p.c. Deb.	9	5	81 1/2	Nil
	Brazil	—	—	—	—	—	—	—	—	—	—	Bonds.	16	11 1/2	151 1/2	31 1/2
	Buenos Ayres & Pacific	2,806	11.9.37	79,591	+	3,473	11	845,782	790,281	+	55,501	Ord. Stk.	171 1/2	6	10	Nil
	Buenos Ayres Central	190	28.8.37	\$159,300	+	\$23,000	9	\$1,320,000	\$1,061,300	+	\$258,700	Mt. Deb.	311 1/2	11	31	Nil
	Buenos Ayres Gt. Southern	5,084	11.9.37	127,916	+	15,740	11	1,261,787	1,171,902	+	89,885	Ord. Stk.	315 1/2	13 1/2	22	Nil
	Buenos Ayres Western	1,930	11.9.37	49,566	+	12,154	11	488,587	420,702	+	67,885	"	295 1/2	11	19 1/2	Nil
	Central Argentine	3,700	11.9.37	130,695	—	22,196	11	1,445,454	1,438,965	+	6,489	"	329 1/2	8 1/2	20	Nil
	Do.	—	—	—	—	—	—	—	—	—	—	Ord.	21	4 1/2	11 1/2	Nil
	Cent. Uruguay of M. Video	980	28.8.37	14,828	+	711	9	1,431,474	1,236,447	—	104,973	Ord. Stk.	75 1/2	3	5	Nil
	Cordoba Central	1,218	11.9.37	32,700	—	360	11	407,900	396,910	+	10,990	Ord. Inc.	5	1	4	Nil
	Costa Rica	188	July, 1937	24,688	+	3,250	4	24,688	21,438	+	3,250	Stk.	361 1/2	32	34	57 1/2
	Dorada	70	Aug., 1937	16,900	—	—	35	122,400	112,200	+	10,200	1 Mt. Db.	107	10 1/2	104 1/2	5 1/2
	Entre Rios	810	11.9.37	14,782	+	1,306	11	152,125	132,132	+	19,993	Ord. Stk.	17	6	10 1/2	Nil
	Great Western of Brazil	1,092	11.9.37	6,900	+	1,400	37	262,400	271,300	—	8,900	Ord. Sh.	1 1/2	5 1/2	1 1/2	Nil
	International of Cl. Amer.	794	July, 1937	\$420,213	+	\$109,517	31	\$3,625,846	\$3,307,205	+	\$318,641	"	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	—	—	1st Pref.	1 1/2	3	1/2	—
	La Guaira & Caracas	221	Aug., 1937	5,080	+	135	35	£3,200	37,195	+	6,005	Stk.	8	3	7 1/2	Nil
	Leopoldina	1,918	11.9.37	24,842	+	4,729	37	847,172	680,318	+	166,824	Ord. Stk.	101 1/2	31 1/2	5	Nil
Mexican	483	7.9.37	\$335,600	+	\$76,600	10	\$2,941,000	\$2,484,300	+	\$456,700	"	11 1/2	1 1/2	1 1/2	Nil	
Midland of Uruguay	319	July, 1937	7,516	—	237	4	7,516	7,783	—	237	"	11 1/2	1 1/2	1 1/2	Nil	
Nitrate	384	31.8.37	4,993	+	2,085	35	105,981	87,021	+	18,960	Ord. Sh.	63 1/2	41 1/2	2 1/2	Nil	
Paraguay Central	274	4.9.37	\$3,642,000	+	\$768,000	10	\$33,689,000	\$25,462,000	+	\$8,227,000	Pr. Li. Stk.	85	71	81 1/2	7 1/2	
Peruvian Corporation	1,059	Aug., 1937	92,587	—	5,347	9	173,721	171,561	+	2,160	Pref.	15	9	8 1/2	Nil	
Salvador	100	4.9.37	£10,410	—	£4,390	10	£15,459	£107,974	+	£7,485	Pr. Li. Db.	18	16	22 1/2	Nil	
San Paulo	153 1/2	5.3.37	37,498	+	640	36	1,187,920	1,072,875	+	115,045	Ord. Sh.	86	46 1/2	83 1/2	6	
Taltal	180	Aug., 1937	4,555	+	930	9	7,495	6,150	+	1,345	Ord. Sh.	115 1/2	14 1/2	1 1/2	87 1/2	
United of Havana	1,353	11.9.37	18,253	+	3,595	11	197,588	172,117	+	25,481	Ord. Stk.	31 1/2	1	2 1/2	Nil	
Uruguay Northern	73	July, 1937	766	—	139	4	766	905	—	139	Deb. Stk.	5	3	6	Nil	
Canada	Canadian National	23,766	7.9.37	747,839	+	15,961	36	26,376,811	24,030,148	+	2,346,663	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—	—	Perp. Dbs.	76	51	67 1/2	51 1/2	
	Grand Trunk	—	—	—	—	—	—	—	—	—	4 p.c. Gar.	104 1/2	99 1/2	101 1/2	31 1/2	
Canada	Canadian Pacific	17,228	7.9.37	612,000	—	6,800	36	18,761,400	17,745,000	+	1,016,400	Ord. Stk.	163 1/2	101 1/2	10	Nil
India	Assam Bengal	1,329	20.8.37	38,182	+	3,501	20	510,004	472,217	+	37,787	Ord. Stk.	87 1/2	82 1/2	77 1/2	37 1/2
	Barsi Light	202	20.8.37	2,257	—	315	20	51,412	50,512	+	3,900	Ord. Sh.	77 1/2	65 1/2	48	107 1/2
	Bengal & North Western	2,111	31.8.37	62,678	—	5,769	22	1,249,615	1,145,651	+	103,964	Ord. Stk.	319	292 1/2	307	57 1/2
	Bengal Doonars & Extension	161	31.8.37	5,255	+	1,085	22	56,322	52,370	+	3,952	"	127 1/2	118	89 1/2	6 1/2
	Bengal-Nagpur	3,288	31.8.37	18,175	+	22,228	22	2,891,834	2,559,736	+	332,098	"	104	100 1/2	90 1/2	47 1/2
	Bombay, Baroda & Cl. India	3,072	10.9.37	209,400	+	15,225	23	3,936,750	3,639,450	+	297,300	"	114	110 1/2	111 1/2	5 1/2
	Madras & Southern Mahratta	8,229	20.8.37	130,500	+	3,947	20	2,225,458	2,210,220	+	15,238	"	116 1/2	108 1/2	108 1/2	7 1/2
	Rohilkund & Kumaon	516	31.8.37	10,930	—	749	22	231,551	228,650	+	5,901	"	311	286	310	51 1/2
	South Indian	2,531 1/2	20.8.37	115,009	+	14,565	20	1,627,983	1,569,532	+	58,451	"	107 1/2	102 1/2	101 1/2	57 1/2
Various	Beira-Umtali	204	July, 1937	97,402	+	29,426	43	774,298	645,518	+	128,780	—	—	—	—	—
	Egyptian Delta	620	31.8.37	7,355	—	992	22	97,164	88,469	+	8,695	Pr. Sh.	24 1/2	19 1/2	1 1/2	Nil
	Great Southern of Spain	—	—	—	—	—	—	—	—	—	Inc. Deb.	11 1/2	13	3 1/2	Nil	
	Kenya & Uganda	1,625	May, 1937	216,935	—	20,539	22	1,334,126	1,229,899	+	104,227	B. Deb.	50 1/2	37	46	75 1/2
	Manila	—	—	—	—	—	—	—	—	—	Inc. Deb.	97	93 1/2	95	4 1/2	
	Midland of W. Australia	277	July, 1937	10,245	+	31	4	10,245	10,214	+	31	"	—	—	—	—
	Nigerian	1,900	24.7.37	35,619	+	8,969	17	852,744	485,146	+	367,598	"	—	—	—	—
	Rhodesia	2,451	July, 1937	412,400	+	109,751	43	3,764,458	2,887,519	+	876,939	"	—	—	—	—
	South Africa	13,263	21.8.37	670,175	+	42,197	21	12,937,444	12,093,019	+	844,425	"	—	—	—	—
	Victoria	4,774	May, 1937	822,932	+	43,220	48	9,342,068	8,986,232	+	355,836	"	—	—	—	—
	Zafra & Huelva	112	June, 1937	10,643	+	1,375	26	80,960	57,843	+	23,017	"	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1%.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements are based on the current rates of exchange and not on the par value.

Electric Railway Traction

Conductor Rail Sections

THE extremely dense traffic now operated over the majority of low voltage d.c. urban and suburban systems has in many cases necessitated an increase in the conductor rail section and weight. Although the Southern Railway still uses a 100 lb. per yd. rail for its main line and suburban routes (with lengths of 150 lb. per yd. on certain sections), it is one of the few instances of a modern installation now using less than 120 lb. rails. The Tyneside lines of the L.N.E.R. are an example of a route by no means heavily-trafficked from an electric traction standpoint on which it has been found desirable to lay 120 lb. rails in place of the 85 lb. rails of the original 1904 electrification, and on the Liverpool-Southport line of the L.M.S.R. 105 lb. rails have replaced the old 70 lb. section. With heavy trains taking starting or accelerating currents of 2,000 to 4,000 amp., the advantages of a third rail section of at least 120 lb. are now generally considered to outweigh its disadvantages, and weights up to 30 per cent. greater than this figure are by no means unusual. But the form of the section varies enormously, from the blunt, solid 150 lb. section with a web thickness of 2.75 in. and a total depth of 4 in. as used in American suburban systems, to the spidery 155 lb. section of the French State Railways' Paris suburban system, which has a maximum thickness of about 1.3 in. and a total height of 9.3 in. (see p. 168 of the July 24, 1936, issue of this Supplement). The L.P.T.B. uses an almost rectangular section weighing 130 lb. a yd. in tunnels and a 150 lb. flat-bottomed section in the open. The maximum surge voltage in a third rail occurs when the current being interrupted is great enough to saturate the rail magnetically, and the square or thick types of conductor rail provide room for a very great amount of flux, proportionate to the largest circle which can be drawn within the section. The square or thick type of rail is used only on urban lines with dense traffic, although many of these systems, e.g., the Paris Metro and Berlin Stadtbahn, use flat-bottomed sections.

Locomotive Standardisation

THERE is probably no better illustration of the merits of standardised locomotive design, and certainly no more extensive use of the principle, than exists on the 3,000 volt d.c. electrification of the South African Railways. The design of the 95 double-bogie four-motor locomotives built by Metro-Vick in the years 1925-27 has been perpetuated in the locomotives built within the last two years to cope with increasing traffic and new extensions, but with the incorporation of modifications in detail and layout which a decade of running experience has shown to be desirable and including all the improvements in electrical and mechanical equipment resulting from normal progress within that time. This means additional stocks of spare parts at depots and the necessity for the staff becoming familiar with certain new constituents, but it would be hard to find a case where so little change was needed to bring an old locomotive design thoroughly up to date. These locomotives operate all classes of traffic from slow freight and returning empties to mail trains, and work singly or in double and triple unit. Apart from a handful of shunting locomotives built by the South African Railways, these locomotives are the only type used on the 380-mile electrified system. The 95 original locomotives have been supplemented by 22 units delivered

by Metro-Vick in 1935-36 (see issue of this Supplement for July 23) and by three built in Germany, and within the last week or two Metro-Vick has received an order for a further 20 locomotives.

Metadyne Control for D.C. Equipments

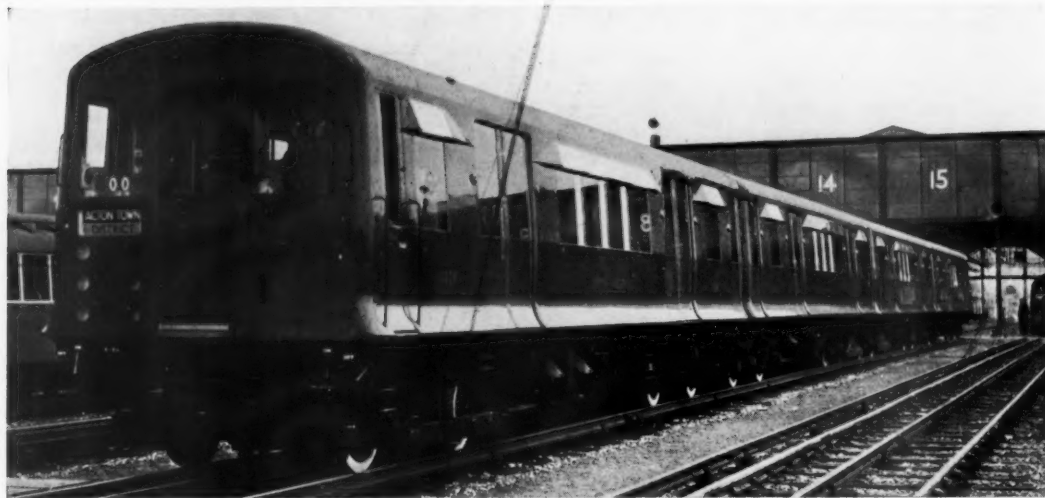
THE metadyne system of control can give any desired speed-torque characteristic to the traction motors from standstill to full speed and from full speed to stop. This is accomplished inherently by the machine which thus takes the place of the starting resistances, accelerating relays, switches, cam groups, &c., of the standard equipment used in acceleration, and in addition provides means for the regenerative control of the train to a standstill. The shape of this characteristic can be varied at will, if desired, by the driver. It is possible, therefore, either to produce an equipment to operate automatically to a schedule or one having the flexibility of control of the steam locomotive, without any peaks or drop in tractive effort associated with standard equipments due to resistance notching and transitions. The metadyne unit consists of three commutator type machines all mounted on one shaft.

- (a) The regulator which starts the machine and keeps it running at a fixed speed.
- (b) The metadyne proper which feeds the armatures of the traction motors.
- (c) The exciter, which provides excitation for the metadyne "variator winding" and the fields of the traction motors.

The regulator in its simplest form is a shunt machine, while the exciter is a generator with a separately-excited field winding. The metadyne proper consists of an ordinary armature with its commutator, operating in a field system. The essential fluxes producing the various voltages at the four brushes with which the commutator is fitted are produced due to armature reaction by the current flowing from the line and in the motor loops. The back e.m.f. of the metadyne is produced by the armature reaction due to the currents in the motor loops, so that irrespective of the speed of the motors this back e.m.f. must be maintained. Accordingly, the current in the motor loops remains constant within the limits of saturation of the machine. The current in the motor loops can be altered by superimposing on the axis of armature reaction an additional flux, which subtracts from the effect of the armature reaction. As the back e.m.f. must be maintained, additional current is drawn from the line and the current in the motor loops is increased to produce a greater armature reaction which will compensate for the effect of this external flux. By suitably controlling the exciter field any desired characteristic can be given to the motors. In regeneration, in order to avoid excessive voltage on the metadyne brushes the motor armatures are connected across adjacent brushes. In this case the motors are acting as generators, and as the back e.m.f. of the metadyne must again be maintained, the currents in the motor loops producing the armature reaction must remain substantially constant unless modified by the variator winding. The current delivered to the line gradually diminishes as the speed of the train falls until at standstill the current in the motor loops producing the back e.m.f. is actually drawn from the line. It will be seen, therefore, that the metadyne is in effect a converter which inherently and automatically gives a positive or negative boost to the back e.m.f. of the traction motors in order to balance the line volts, overcome the C.R. drop of the machines and produce the desired characteristic.

NEW ELECTRIC TRAINS FOR LONDON TRANSPORT

Metadyne control incorporated in a large number of cars



1,200 h.p. four-car train made up of two two-car units

THE first stage in a comprehensive equipment and renewal programme for the rolling stock of the London Passenger Transport Board's surface lines has begun with the delivery of the first four cars of an order for 116 motor-coaches. The complete scheme is estimated to cost £1,700,000, and comprises the modernisation at the board's Acton works of much of its post-war stock, the construction of 116 new motor-coaches at Birmingham and Gloucester, and of 401 new motor-coaches and trailers at Gloucester, all for operation on the District and Metropolitan Lines.

Build by the Birmingham Railway Carriage & Wagon Co. Ltd. and the Gloucester Railway Carriage & Wagon Co. Ltd., the 116 motor-coaches are being arranged in two-car sets, semi-permanently coupled together, each car

having two traction motors, one on each bogie. The metadyne control forms the principal innovation, but many of the mechanical details are derived from the four experimental trains built last year for the deep-level tubes, and described in detail in the issue of this Supplement for December 11, 1936. Higher accelerative and decelerative powers compared with the previous stock, greater comfort, and better operating facilities are further improvements embodied in these trains.

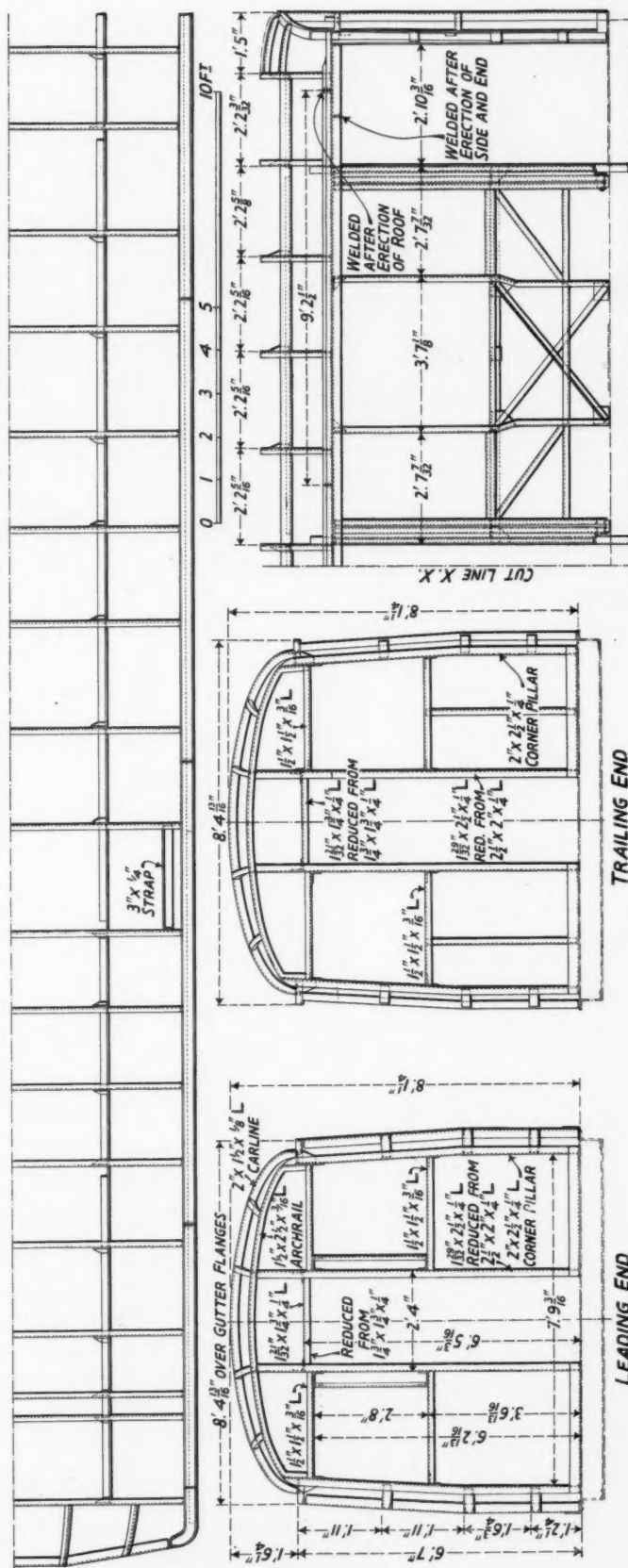
Body and Framework

Combined welded and riveted construction has been adopted for the body framework and for the underframe. Both frames are arranged as a single integral structure of box girder form, so that both portions take their due share of the load. Over the framework each car measures 51 ft. 1½ in. There are one single and two double passenger doors and one single staff door on each side; at the ends the vertical pillars are of angle section or of steel channel pressings, but between the two double sliding doors the vertical pillars are of a special triangular section, chromium plated, as shown in one of the accompanying drawings, this section having been evolved to give adequate strength while providing a larger range of vision to passengers inside the car. Exceptionally stiff cantrails and waist rails of channel and box forms are utilised; to the former the pillars are attached through pressed steel gussets, and the angle section roof sticks directly. It will be noticed from the frame arrangement drawing reproduced herewith that the arduous duties and heavy loading of subway trains has called for the provision of very rigid diagonal bracing of the side members, and also for the inclusion in the



Interior of the new surface line stock of the L.P.T.B.

ROOF SHEET AT THIS POINT TO BE LEFT OFF UNTIL BODY UNITS ARE ASSEMBLED



General arrangement of the body framing of the new L.P.T.B. stock

framework of a longitudinal angle member between the waist rail and the floor. The principal members of the underframe are the two outside longitudinals, which are of Z section.

Each car has seating accommodation for 40 passengers plus two tip-up seats at one end for use during busy periods, and there is a large standing capacity down the centre and in the entrance and exit vestibules. The sliding doors are air-operated, under the control of either the passengers or the guard, but the push-button control is located on the door pillars and not on the frame itself as used on the experimental train of the Hammersmith & City line. During rush hours the doors will be operated simultaneously by the guard, as on the deep level tubes, and in all cases the guard must press a button in his compartment before the passengers in the train or on the platforms can open the doors. In each case, too, the guard is responsible for the closing of the doors. The air motors are controlled electrically from a 50-volt supply.

The interior is simple but attractive. All seats are fitted with loose cushions, and the use of chromium plate together with the decorative veneer and paint used for the

special adjustable weatherproof ventilators above the windows.

Automatic couplers are provided at the outer ends of each two-car unit. The couplers are of the Wedglock pattern, described in THE RAILWAY GAZETTE for February 14, 1936, and they effect instantaneous and automatic coupling of the mechanical, electrical and pneumatic connections. A feature of the Wedglock coupler is that any wear of the mechanism is taken up automatically by the wedge action inherent in the design. The control is electro-pneumatically operated by a push-button in the driving cab.

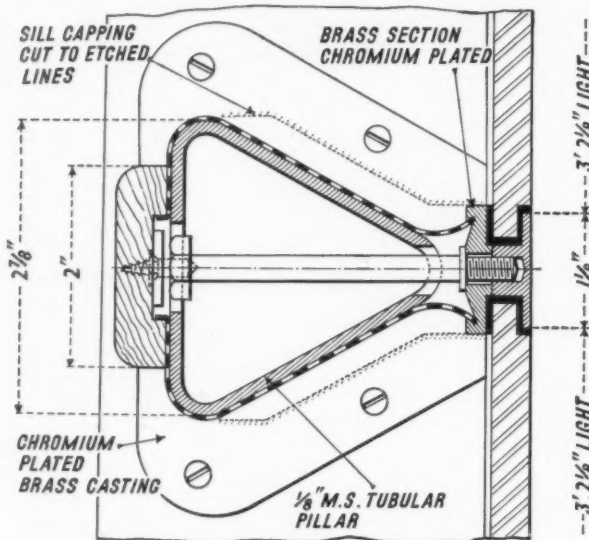
Bogies and Brakes

In accordance with the practice introduced on the latest tube trains, the bogies are of welded steel construction, and each is of the motored type, with one G.E.C. traction motor driving the outer axle. An examination of the bogie arrangement drawings reproduced with this article indicates at once two of the leading features of the design, viz., the unequal spacing of the axles about the centre of the pivot, and the wide transverse spacing of the swing links and bolster springs. As the two axles are unequally loaded, the motor axle taking about 60 per cent. of the weight, the proportions of the overhung laminated springs and their helical auxiliaries are different, and this, in conjunction with the design of the bolster suspension and the deflection characteristics of the bolster springs, has given a remarkably easy riding vehicle without any tendency to synchronised oscillations. Moreover, by bringing the swing links and their pins and bearer brackets outside the frames, certain aspects of maintenance have been simplified.

By the use of welding, material has been put in just where it is most useful, e.g., the thickening plate on the outside of the frames round the axleboxes, and in the connection of the centre and end transoms to the frame members. In this second instance especially, the benefits of welding appear in a striking manner if a comparison is made with the huge riveted gussets and knees of some of the old Metropolitan and District stock. The wheels are of the spoked pattern, 36 in. diameter on tread, and the axles are carried in Hoffmann or Skefko roller bearing axleboxes. The centre pivots have Timken taper roller bearings, and the side bearers are of the simple single roller type now standard for Underground stock. The two outer bogies of each two-car train carry spring-supported collecting shoes suspended from the usual wooden beam, but provision has been made for the easy installation of extra shoes near the inner bogies should this prove desirable because of long gaps between the conductor rail on certain sections.

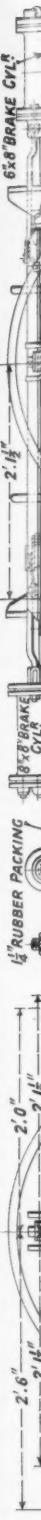
Five types of braking are possible, viz., light regenerative braking for checking the train, full regenerative in combination with electro-pneumatic braking, electro-pneumatic braking alone, an automatic air brake application, and hand braking. As only half the axles in any train are motored, the regenerative braking from the metadyne is not sufficient alone to give the high retardation force desired for these new trains, and therefore the trailer axles are fitted with electro-pneumatic braking of the Westinghouse type. The first four types of braking mentioned above are obtained by a special arrangement of the brake valves. Owing to the high rate of retardation, up to 3 m.p.h.s., a Westinghouse mercury pendulum retardation controller is used to control the braking force according to the speed, giving full application at the top speeds and reducing the air pressure in the cylinders to prevent wheel slide at slower speeds. The Westinghouse automatic brake is fitted to give emergency braking in the event of a breakaway or an electrical failure.

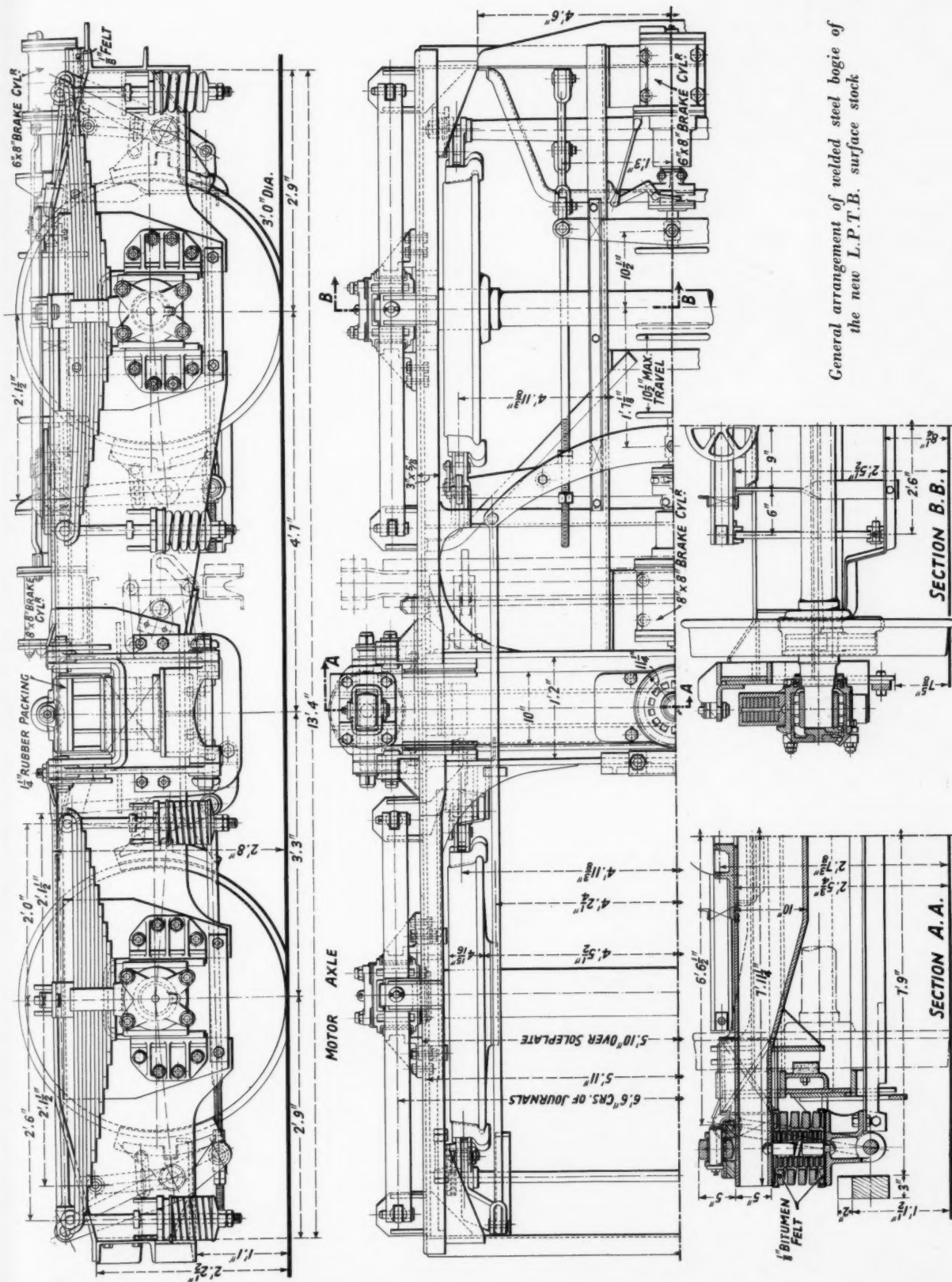
A simplification of the brake rigging, and thus an



Section of triangular body pillar at about the mid-depth of the windows

finish gives the cars a light and roomy appearance. Electric heaters are located at various points beneath the seats, and are fed from the 600-volt traction supply. The lighting is of the indirect type with lamps down each side, fed from a 50-volt circuit supplied from a 5-kW. motor-generator set, of which there is one on each two-car set. Externally the windows are flush with the steel side panels, and this has been effected by the use of rebated glass, as shown in the drawing of the body pillar. The side panels have been flared out at the bottom, and the lower part of the sliding doors also follows this contour. Each car contains a smoking and a non-smoking saloon, and the division between them has been arranged in a most ingenious and effective manner. The side bulkheads between the two saloons are of double glass, and the space between them leads down below the car floor to the metadyne, the self-ventilating fan of which is arranged to pull the air from the passenger saloons down through the duct between the two parts of the car, and this prevents the air from one saloon penetrating into the adjacent part. The ventilating air is introduced into the cars through





General arrangement of welded steel bogie of the new L.P.T.B. surface stock

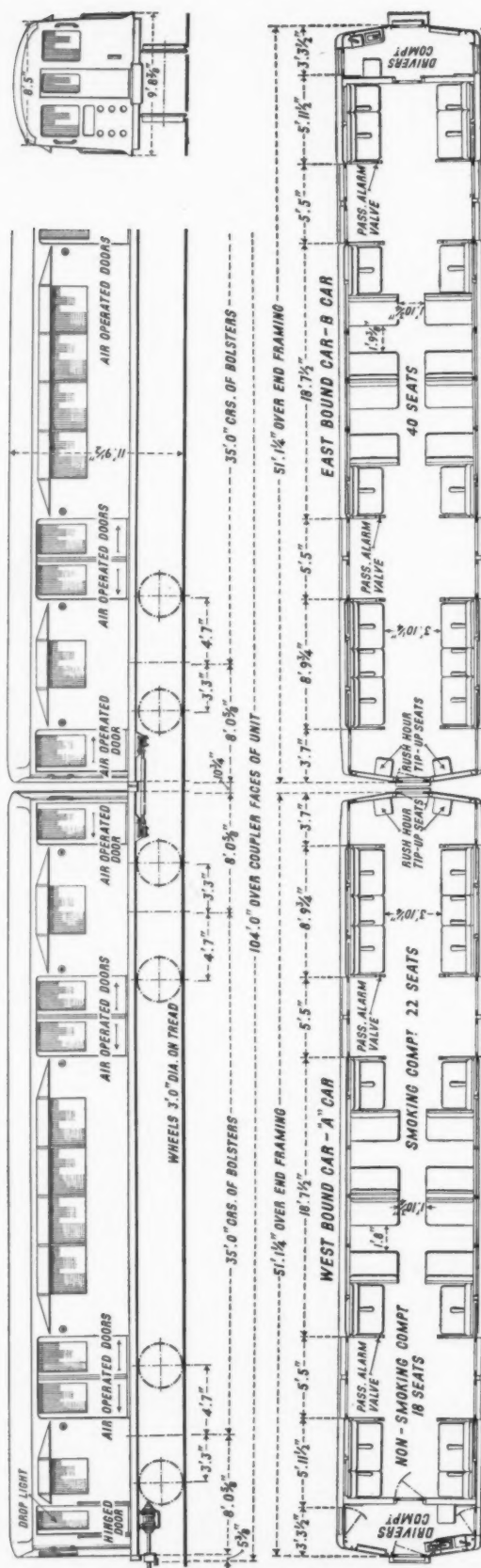


Diagram of the latest 600 h.p. 71½-ton two-car units for the surface lines of the London Passenger Transport Board

increase in its efficiency, has been attained by mounting the brake cylinders on the bogie, although the main and intermediate reservoirs are carried below the car under-frame. There is one cylinder actuating the two blocks on each driving wheel and another cylinder operating those on the carrying wheels. Adjustment is carried out easily and quickly by means of two handwheels acting on the slack adjuster. Previous experiments conducted at high rates of deceleration showed that the anti-friction brake blocks commonly used on the Underground cars produced such a smooth surface on the tread of the tyre that with acceleration rates of the order of 2 m.p.h.p.s. there was a tendency for the wheels to slip, and therefore cast iron blocks have been re-adopted, despite the problems of frequent renewals and brake shoe dust which first caused experiments to be made with anti-friction shoes.

Electrical Equipment

The main feature of the electrical equipment of the new trains is the metadyne control developed by the Metropolitan-Vickers Electrical Co. Ltd. Its main characteristics are described on the front page of this Supplement. Each car of the rake has its own metadyne installation controlling the two 150 h.p. G.E.C. nose-suspended traction motors of that car. By motoring half the axles down the train, obtaining about 60 per cent. of the total weight for adhesion, and adopting metadyne control, it has been found possible to accelerate smoothly up to rates in excess of 2·0 m.p.h.p.s. An interesting item in the auxiliary equipment is the new type of speedometer. Projections are cast on the spokes of the driving wheels, and those on one wheel at each end of the car pass through a magnetic field supported on the bogie frame; the speed is a function of the periodicity and is read off a dial in the driver's cab in the usual manner. Further developments of this principle are being made.

The main contractors for these 116 new cars are the Gloucester Railway Carriage & Wagon Co. Ltd., the Birmingham Railway Carriage & Wagon Co. Ltd., and the Metropolitan-Vickers Electrical Co. Ltd. The principal subcontractors are as follow:

Traction motors	General Electric Co. Ltd.
Pneumatic door gear and automatic couplers.	G. D. Peters & Co. Ltd.
Springs	J. Woodhead & Sons Ltd.
Special glass	Pilkington Bros. Ltd.
Alpax doors and air duct grilles.	Lightalloys Limited.
Straphangers	G. Spencer Moulton & Co. Ltd.
Traction gears and motor-generator sets.	Metropolitan-Vickers Electrical Co. Ltd.
Car heaters	Equipment & Engineering Co. Ltd.
Car ventilators and internal window fittings.	Austers Limited.
Lighting fittings	Benjamin Electric Limited.
Batteries	Young Accumulator Co. Ltd.
Compressors	Westinghouse Brake & Signal Co. Ltd.
	British Thomson-Houston Co. Ltd.
Windscreen wipers	Klaxon Limited.
Brake equipment	Westinghouse Brake & Signal Co. Ltd.
Advertisement frames	G. Beaton & Son Ltd.
Bogie pivot roller bearings	British Timken Limited.
Driver's loudspeaker equipment.	Clifford & Snell Limited.
Multi-point connection boxes.	Patent Lighting Co. Ltd.
Plywood panels and doors	Tucker Armoured Plywood Co. Ltd.
Roller bearing axleboxes..	Hoffman Manufacturing Co. Ltd.
	Skefko Ball Bearing Co. Ltd.
Suspension sleeves	Hoffman Manufacturing Co. Ltd.
Seat springs	Lace Web Spring Co. Ltd.
Moquette	J. Holdsworth & Co. Ltd.
Fire extinguishers	Valor Co. Ltd.
Speedometers	Everett, Edgcumbe & Co. Ltd., Evershed & Vignoles Ltd.

TWO NEW MOUNTAIN CABLE LINES

By Ad.-M. HUG, M.I.M.E.

TOWARDS the end of 1936 two important electric cable railways were opened in northern Italy, one on the Riviera and the other in the mountains to the southern side of the Matterhorn (Mont Cervin).

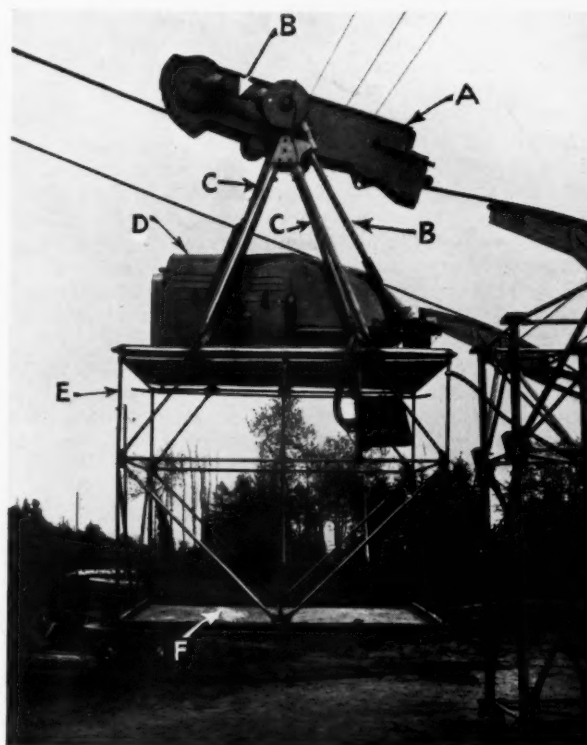
The Alpine line begins at Breuil, in the Val Tournanche, and climbs from 6,500 ft. there to a height of 8,500 ft. at Plan Maison-Belvedere, and forms the first section of an Italian line up the Matterhorn. The next higher section is now being erected, and eventually will bring the winter sports visitors up to the Theodule pass between the Matterhorn and the Breithorn, at a height of 9,000 ft. The cable cars have a capacity of about 30 persons and make the journey up in about 10 min., and as the down car passes the up car about halfway, the line has an hourly capacity of about 150 passengers each way. For the trip to Theodule it will be necessary to change at Plan Maison-Belvedere, and the journey from Breuil will take half-an-hour.

The new cable line on the Riviera runs from San Remo to the summit of Monte Bignone, 4,000 ft. high. With a length of five miles, this system is one of the longest passenger cable railways in the world. It is divided into three sections, and the highest division has a free cable span of 1,900 yd. The lowest section is worked by cars holding 25 passengers and leads to the golf links, where there is a casino-restaurant; the second section ends at the hamlet of San Romolo, and the third leads thence to the summit.

It was intended originally that this line should be worked on the motor system, in which there is no traction cable and each car is fitted with its own oil engine or electric motor, a transmission cable being required with the second alternative. Trials of such a system have been made at Bologna, but due to lack of experience in this form of traction the authorities would not allow the Cia. Italiana Funivie Bologna, the builder of the line, to adopt it, and it has been built provisionally on the traction cable.

system, although the stations and the vehicles have been built with a view to easy transformation.

The motor principle of the proposed method is shown clearly in the accompanying illustration of part of the trial line at Bologna, in which an electric motor was used for the propulsion. The six cars now in service on the San Remo line were built by Ansaldo to the designs of the author; the framework is built up of stainless steel plates and sections electrically welded, and the rolling mechanism and suspension system is mainly of aluminium alloy.



Upper right: Experimental installation of non-traction cable system of aerial ropeway

Right: The Italian cable line up the lower slopes of the Matterhorn, viewed from Breuil

Below: The Matterhorn cable line looking down from Plan Maison-Belvedere



NOTES AND NEWS

The English Electric Company.—In commending the collaboration between various British electrical companies in the design and equipment of the new Tyneside rolling stock of the L.N.E.R., on p. 337 of the August 20 issue of this Supplement, we unfortunately omitted the name of the English Electric Co. Ltd. from the list of constituent companies of Associated Manufacturers of Electric Traction Equipments Limited. English Electric, of course, has been connected with this concern since the formation early in 1935, and even prior to that date was giving its customers the benefits of collaboration, by its technical pooling arrangement with the Metropolitan-Vickers Electrical Co. Ltd.

Swedish Electrification.—The 30-mile connecting line of the Swedish State Railways between Örebro and Svartå has been electrified on the standard 15 kV. single-phase system.

Interborough Line Consumption.—The electric trains and equipment of the Interborough rapid transit system in New York consume 1,160 million kWh. of electric energy each year, which is supplied from two power stations and converted in 25 substations.

Polish Proposals.—Reports in the Polish press indicate that a British electrical group is negotiating with the Polish Government for the electrification of certain railways in the Carpathian mountains. The electrification cost is spoken of as being in the neighbourhood of £4,000,000.

Dutch Current Consumption.—The energy cost during the year 1936 of the electrified sections of the Netherlands Railways, totalling 146 miles, was 2,219,000 florins (£245,000 at the present rate of exchange), an increase of 9½ per cent. over the figure for the previous year.

Greek Electrification.—The Greek Minister of Railways and the President of the Athens Electric Company have been on a visit to England in connection with the purchase of material for the electrification of the Athens-Kiphissia line, the intended conversion of which was recorded in the issue of this Supplement for July 23.

Generating Plant in Australia.—The Victorian Government Railways is planning the complete reconstruction of Newport A power station, which supplies energy to the Melbourne electric suburban railways. Tenders are being called for a 30,000 kW. turbo-alternator set and two boilers with an hourly evaporative capacity of 150,000 lb. each.

Battersea Extension.—The celebrated Battersea power station of the London Power Co. Ltd. is to be extended by the installation of additional equipment amounting to 100,000 kW. The existing plant has a capacity of 243,000 kW., and its overall thermal efficiency, 28·6 per cent., is higher than that of any other generating station in Great Britain.

Indian Electrification Activity.—The Great Indian Peninsula Railway has prepared a scheme for the control from a central point of the 12 substations on the main line electrified section between Kalyan, Igatpuri and Poona. The cost is estimated to be Rs. 2·97 lakhs and the yearly saving Rs. 46,500. For service in the Bombay district, 26 new electric coaches may be purchased.

Moscow Electrification.—The Moscow suburban electrified system is being extended northwards along the Yaroslavl main line from the present electrified terminus, Sagorsk, to Alexandrov, a distance of 26 miles, and trial

trips with multiple-unit trains have begun. Alexandrov being considered as well out of the suburban zone, electric locomotives are being introduced to haul through trains to and from that station.

L.M.S.R. Electrification.—According to an article contributed to the German journal *Elektrische Bahnen* by Mr. C. E. Fairburn, Deputy Chief Mechanical Engineer and Electrical Engineer, of the L.M.S.R., the current consumption of the Liverpool-Southport lines is about 44,000,000 kWh. yearly; of the Euston-Watford and Broad Street-Richmond lines about 92,000,000 kWh.; and of the Campbell Road-Upminster section (operated jointly with the L.P.T.B.) about 30,000,000 kWh. On the Euston-Watford and Broad Street-Richmond section the maximum load over a period of half an hour is 26,320 kW.; on the Manchester-Bury line it is 5,000 kW. taken over a period of one hour.

Electrotechnical Journal.—The Proceedings of the Institute of Electrical Engineers of Japan, previously printed in Japanese with brief summaries in English, has been divided into two portions, one, as before, printed in Japanese, and the second, known as the *Electrotechnical Journal*, printed in English. The second portion is considered as an overseas edition and contains items of news as well as summaries of the institute's papers.

Multi-Notch Control.—In the August issue of the G.E.C. Journal is published an article by Mr. E. H. Croft, of the G.E.C. Traction Department, dealing with the multi-notch control evolved by that company for the experimental tube trains of the L.P.T.B., described in the issue of this Supplement for December 11, 1936. The article covers eight pages and is fully illustrated with diagrams and photographs.

More Locomotives for South Africa.—Yet a further order for Bo + Bo electric locomotives has been received by the Metropolitan-Vickers Electrical Co. Ltd. from the South African Railways and Harbours. They are intended for service on the Natal lines and will be similar to the existing 120 Metro-Vick locomotives, the last of which was described in the issue of this Supplement for July 23. The present contract covers the supply of 22 of these 1,200 h.p. locomotives at a cost of nearly £300,000.

German Locomotives for South Africa.—Three 1,200 h.p. double-bogie electric locomotives of generally standard design have been delivered to the South African Railways by Henschel & Sohn A.G. and the Siemens-Schuckertwerke A.G., the former supplying the mechanical portions and the latter the electrical equipment. They weigh 67 tons and are fitted with Timken taper roller bearing axleboxes, Alliance couplers with Spencer-Moulton rubber springs, and Westinghouse brakes. The top speed is 45 m.p.h.

Moscow Underground.—Further plans for the construction of another 125 miles of the proposed Moscow Metro network have been drawn up, and the construction of 30 miles has been sanctioned for completion by 1942. These 30 miles include a circular line to be known as the Sadovaia circle and designed to reduce transfer traffic at the city stations, and a 4-mile line extending southwards from the existing Metro station at Sverdlovsk Place to the Stalin automobile factory, passing by the Pavlezki main-line station, and crossing under the Moscow river twice by deep-level tunnels. Another line, 4½ miles long, is to connect the Kursk main-line station with the All-Union Stalin Stadium.